

TROPICAL DISEASES BUREAU.

## SANITATION SUPPLEMENTS

OF THE

## TROPICAL DISEASES BULLETIN.

## APPLIED HYGIENE IN THE TROPICS.

By LT.-COLONEL W. WESLEY CLEMESHA, C.I.E., I.M.S. (retd.).

SUPPLEMENT No. 1.]

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MARCH 30TH.

## DISEASE PREVENTION.

VAN LONKHUIJZEN (J. J.). [In Dutch and English.] **Beschouwingen omtrent de taak die de gewestelijke raad van Cheribon op zich zou kunnen nemen ter verbetering van de volksgezondheid in het gewest. Considerations on the Task which the Provincial Council of Cheribon might undertake for improving the Hygienic Conditions in that Province.**—*Meded. v. d. Burgerlijk. Geneesk. Dienst in Nederl.-Indië*. 1920. Pt. 10. pp. 50-75. With 4 illustrations.

This is one of the most interesting papers that we have come across for some time—not that it contains much that is new to the real sanitarian, but because it puts in a few sentences conclusions that are all too little recognized by many who may be called “amateur” sanitarians.

Before commencing the review of this work it may perhaps be permitted to point out that it would appear to us that our colleagues in the Dutch Indies are not conversant with the literature on tropical research work in India. We have been struck by this on former occasions. Two examples of what we mean may be quoted from this paper.—(1) The author says that perhaps if we knew the cause of the violent epidemics of malaria that occur, we might be able, in the less malarious seasons, to prevent these murderous recrudescences. In India the malaria epidemic has been worked out by CHRISTOPHERS, GILL, PERRY, BENTLEY, and others (see *Indian Journal of Medical Research*), and we may be said partially to understand the “mechanism” of these outbreaks. We do not suppose that what applies to the Punjab is true in every detail on the coast of Java, but the Indian work might suggest the correct explanation. (2) Again, CHRISTOPHERS’ report on malaria in the Andamans, written about 1905, was probably the first description of a *Ludlowi* outbreak of malaria. The conditions described by him are almost identical with those on the coast of Java.

The foregoing remarks are not made in any spirit of criticism, but with the idea of assisting workers in different parts of the world.

The author sounds the right note at the commencement by saying : "Combating malaria at haphazard mostly leads to great disappointment and, anyhow, to needlessly throwing away money." He develops the argument by pointing out that antimalarial measures must be viewed from three different points, viz.: (1) the scientific; (2) the technical; (3) the economic. This sounds like platitude, but very few act on this advice. He then goes on to deal with each of these aspects of the problem in Java. It is suggested that malaria is not simply a matter of filling up hollows, etc., but the causes vary indefinitely; BENTLEY, in Bengal, has shown that in that province malaria is fundamentally an agricultural problem.

*Anopheles ludlowi* is responsible for much of the disease on the coast of Java. Neither *Anopheles maculatus* nor *umbrosus*, the principal Malayan carriers, play an important part in its spread. There is no doubt that the brackish swamps that abound in some parts of the tropics are extremely difficult places to render unsuitable

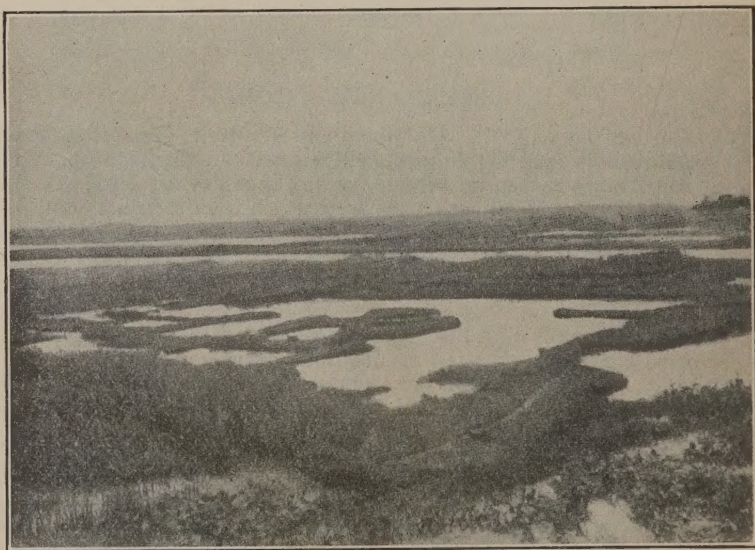


FIG. 1. Landscape round Kapetaken in the Province of Cheribon, Java, showing collections of brackish water likely to favour the breeding of *A. ludlowi*.

for breeding. The author also noticed a fact already mentioned by others, viz., that trees, shrubs, uninhabited houses, warehouses, are no barrier to mosquito flight, but that when they come to a densely populated town most of the insects are found on the outskirts—they do not appear to wish to penetrate far into the interior.

The author then deals with the subject of finance, and it is extremely refreshing to read the commonsense way in which he endeavours to "cut his coat according to the cloth." He points out that anything



like antilarval measures on a sufficiently large scale are prohibitive in price: "It would be much cheaper to shift the whole littoral population to healthier places and provide means of conveyance to their work either by land or water." To this of course there are objections, so the writer is in favour of gradually creating a demand amongst the natives for a more sanitary house in which to live, a house that he can afford, but one that will give him light and air and a certain pride in ownership. He proposes to do this by a simple enactment numbering and registering houses, and prohibiting building without a licence. When the prospective builder comes up for a licence, the site chosen and the kind of house come under discussion, and sound advice is given before the licence is issued.

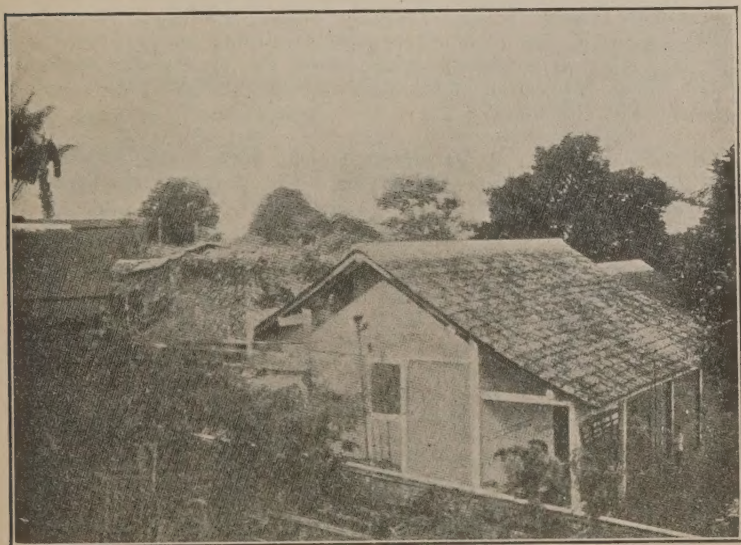


FIG. 2. New rat-proof native house at Malang, Java, with ventilation-opening beneath the roof.

[Reproduced from *Mededeelingen van den Burgerlijken Geneeskundigen Dienst in Nederlandsch-Indië*.]

MACKEOWN (R. J.). **The Health of Seamen and how to safeguard it.**  
—*Jl. State Med.* 1921. Oct. Vol. 29. No. 10. pp. 289-296.

An interesting paper which goes over the usual ground.

"In conclusion, I would strongly urge (1) the creation of an international standard of accommodation on board ships for seamen, by representations to the Board of Trade, Ministry of Health, Admiralties, and the Council of the League of Nations, and (2) the establishment of legislation that all plans of ships proposed to be built must be submitted to a Central Authority in each nation, showing the accommodation provided for the crew, and the work is not to be proceeded with

until approval has been given and to be followed up by inspection during construction."

We rather doubt the practicability of this proposal, however desirable it may be.

HANSON (Henry). **A Study of Sanitary Conditions in Peru, with Special Reference to the Incidence of Malaria.**—*Proc. Med. Assoc. Isthm. Canal Zone.* 1919. Jan.-Dec. Vol. 12. Pts. 1 & 2. pp. 41-54. With 6 plates.

The author gives an account of the sanitary condition of the city of Lima with some remarks on the malaria problem. The sanitation is; from the account given, as bad as in any town we have seen described: rubbish lying about everywhere, bad sewage system, doubtful water supply, and great lack of sanitary conscience on the part of the people. As regards malaria the writer had not time to investigate very fully, but wherever he went he found *Anopheles* and other mosquito breeding-places. He does not say anything about the variety of *Anopheles* nor give any indication of the amount of infection of the public as measured by spleen-rate.

CORRÊA (Sampaio). **O Paludismo em S. Paulo. Sua diminuição depois de iniciada a prophylaxia em 1917.**—*Bol. Soc. Med. e Cirurg. de S. Paulo.* Brazil. 1920. Aug. & Sept. Vol. 3. (2nd Ser.). Nos. 6 & 7. pp. 246-250. With 1 chart.

In this paper, packed with State patriotism, the writer points out that the State of S. Paulo was the first to adopt the campaign against yellow fever inaugurated by the American (Rockefeller) Commission under Walter REED, and has eradicated yellow fever from its boundaries; has practically eliminated variola by compulsory vaccination; has established a leprosarium, and is the first Brazilian State to free its confines of leprosy; is in the forefront in the extermination of ankylostomiasis; and has so carried forward antimalarial work that it is confidently stated that its extermination is close at hand. This confidence is based on the returns of deaths from malaria which from 1897 to 1916 varied between 610 and 1,882, reached 2,043 in 1917 and fell to 266 and 367 respectively in the two following years. Again, the malarial cases admitted to Santa Casa, at the capital, during these last three years numbered respectively 521, 213 and 94. The good effects are attributed to antilarval measures, the only one of which specifically mentioned is the canalization of the river Xarem at the Federal capital.\*

PANAMA CANAL. **Reports of the Health Department of the Panama Canal for the Calendar Year 1920.** [FISHER (H. C.), Colonel, Medical Corps, United States Army, Chief Health Officer.] —129 pp. With 6 charts. 1921. The Panama Canal Press, Mount Hope, C.Z.

"Malaria from cattle camps and plantations also shows a marked reduction, believed to be due largely to the continued use of prophylactic quinine. While it is admitted that this procedure is not ideal, and that, under ordinary circumstances, there are better ways of controlling malaria, the isolation of these camps, their temporary

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\* Summarized by Lt.-Col. Clayton LANE.



nature, and the class of labour (these being largely recruited from the infected native population) seem absolutely to require the use of quinine. Every evening for the first two months following the beginning of employment, each man is given 2½ oz. of an alcoholic solution, containing 10 gr. of quinine sulphate. After this first period of two months, each man is given the same dose morning and evening of each Wednesday as long as he remains in camp. While this treatment is not compulsory, by the co-operation of the foremen it is fairly well carried out, and the malaria incidence has been lowest in those camps where the prescribed measures have been followed closely."

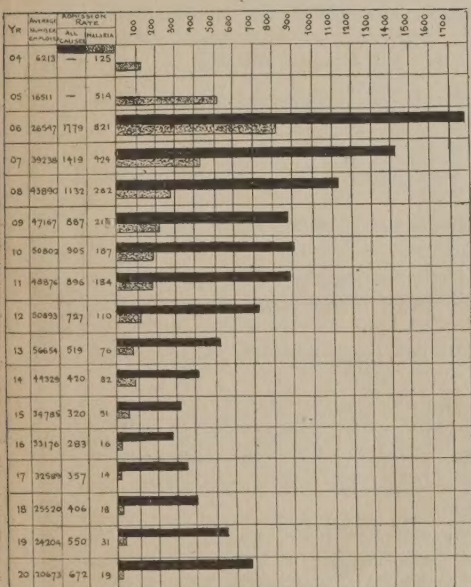


FIG. 3. PANAMA CANAL. Admission rates per 1,000 employees. Hospital and Quarters. All causes and Malaria Fever.

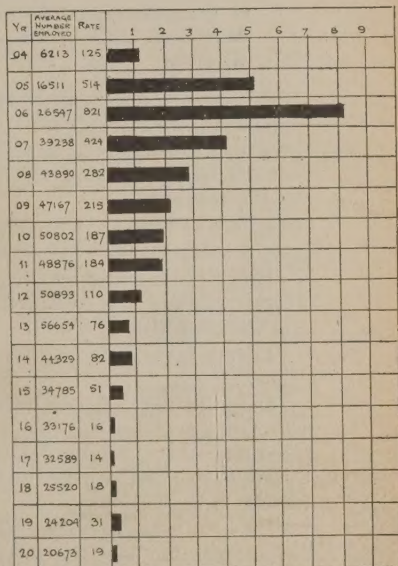


FIG. 4. PANAMA CANAL.—Non-effective rate per 1,000 Employees.

[Reproduced from *Reports of the Health Department of the Panama Canal for the Calendar Year 1920.*]

**DOMINICA. Report on the Roseau Hospital for the Year 1920, and on the Expenditure thereof for the Financial Period 1920-21.**  
[NICHOLLS (H. A. Alford), Senior Medical Officer.]—7 pp.

" Fifty cases of malarial diseases were dealt with, nineteen as inmates with only one death, and thirty-one as out-patients. This indicates that the sanitary condition of the town of Roseau, from which most of the cases come, is gradually being improved; but, until a properly qualified Sanitary Inspector is appointed, it is not to be expected that there will be much further improvement in the abatement of nuisances that imperil the public health. The following table shows

the diminution of the numbers of malarial diseases treated in the hospital during the last four years."

Year.	No. of Cases.			Deaths.
	Inmates.	Out-patients.		
1917 .. ..	85	69	..	13
1918 .. ..	49	32	..	5
1919 .. ..	32	29	..	4
1920 .. ..	19	31	..	1

SERGEANT (Edmond) & SERGEANT (Etienne). **Études épidémiologiques et prophylactiques du paludisme : 17<sup>e</sup>, 18<sup>e</sup> et 19<sup>e</sup> campagnes en Algérie en 1918, 1919 et 1920.**—*Arch. Instituts Pasteur de l'Afrique du Nord*. 1921. Sept. Vol. 1. No. 3. pp. 324-335.

The writers give a series of brief notes on the various phases of the antimalarial work in North Africa.

A dry summer may increase malaria by rendering the current of a stream weaker, so that numerous pools form. This occurred in 1920 in the Rummel.

Effect of heat.—At a temperature below  $+16^{\circ}$  C. *Plasmodium* will not develop in the body of mosquitoes.

Many instances of removal of earth are reported with no malaria. When malaria did accompany the work a mosquito carrier of the disease was always found.

Lemna present in pools does not stop the growth of *Anopheles* or *Culex*.

Bats did not influence the incidence of malaria in the two places in Algeria where they were plentiful. This corresponds with our experience in German East Africa, where the Germans cultivated a particular palm which harboured bats. Bats eat practically all flying insects.

Effect of cold.—Fed *Anopheles maculipennis* placed at a temperature of  $+12^{\circ}$  C. lay eggs and the larvae grow normally. Eggs of the same species kept at a temperature of  $-10$  for five months were killed. "The remedy for malaria is the saucepan" is a Tuscan proverb; that is, poverty and hunger are largely responsible for the fever. Domestic animals, particularly pigs, have been found to be very attractive to *Anopheles*. In a Mohammedan country pigs are not kept.

SERGEANT (Edm. & Et.). **Organisation de la lutte antipaludique à l'Armée d'Orient en 1917 et 1918.**—*Arch. Instituts Pasteur de l'Afrique du Nord*. 1921. Sept. Vol. 1. No. 3. pp. 285-323. With 1 map in text.

The writers give an account of the antimalarial operations in Macedonia with the Army of the East. We have already reviewed this work elsewhere [*San. Supp.*, No. 1, 1921, March 30, p. 13], and although there is much interesting matter there is little new in it, especially if it be read in conjunction with the reports written by the English medical units within the same area.



FALCIONI (Domenico). **Sull' esito di una piccola bonifica. Contributo allo studio della diffusione delle anofele.** [On the Effects of Minor Sanitary Measures. Contribution to the Study of Anopheles Distribution.]—*Policlinico*. Sez. Prat. 1921. Jan. 24. Vol. 28. No. 4. pp. 120-122.

Minor measures (*piccola bonifica*) employed in combating malaria may be very efficacious. In 1916 the Jacobine mines, some disused workings in the neighbourhood of Rome, became flooded and infested with *Anopheles*, so that malaria greatly increased in the immediate vicinity. In June, 1917, the writer oiled these mines and several neighbouring deposits of water with good effect. In 1918 hollows in which water had collected were filled up. By 1919 malaria had practically disappeared from the district.\*

WENYON (C. M.), ANDERSON (A. C.), MCLAY (K.), HELE (T. S.), WATERSTON (J.). **Malaria in Macedonia, 1915-1919. Part I. The Incidence and Aetiology of Malaria in Macedonia** [by WENYON (C. M.)].—*Jl. Roy. Army Med. Corps*. 1921. Aug., Sept., Oct., Nov. Vol. 37. Nos. 2, 3, 4, 5. pp. 81-108; 172-192; 264-277; 352-365. With 5 plates, 20 text figs., 1 map and 4 charts.

"For a campaign in a highly malarious country it seems to me that the following equipment should be at once available:—

"(1) Mosquito nets of two types: (a) Hospital nets of rectangular pattern with a calico strip round the base; (b) Bivouac type, in such numbers that each man may have a net at once and have it replaced immediately when damaged. If phlebotomus is known to occur the mesh should be small—at least twenty-two holes to the linear inch.

"(2) Some form of standard mosquito-proof hut similar to those used in Salonika in 1918. They were made of wood, canvas and copper gauze and can be quickly put together. There should be a definite scale for the supply of these. They can be used as mess-huts for men and officers, and as hospital wards in place of tents, offices, etc. They protect, of course, against flies as well as mosquitoes.

"(3) Copper gauze to mosquito-proof buildings.

"These are far and away the most important, though minor appliances should not be forgotten. Such are:—

"(4) Mosquito boots, especially for officers and sisters.

"(5) Mosquito veils and gloves. The value of these is very limited.

"(6) Special clothing for the men, as, for example, turn-down shorts.

"(7) Some form of mosquito swat to enable men to kill any mosquitoes found in the rooms or tents in the morning.

"(8) Repellents, though these are of very limited use.

"(9) Sprayers and fumigators.

"(10) Pamphlets of a simple kind explaining the dangers of the mosquito and the reasons for the measures taken.

"In addition, there should be a staff consisting of experts, whose sole duty it is to report at once on the malaria incidence and dangers in the various districts to be occupied and to suggest measures of prevention."

The remainder of this most valuable paper will be dealt with in another number.

\* Summarized by Dr. J. R. EARP.

KONSULOFF (Stefan). **Einige Worte ueber die Mosquitohandschuhe.**  
 [Notes on Mosquito Gloves.]—*Arch. f. Schiffs- u. Trop.-Hyg.*  
 1921. Vol. 25. No. 9. pp. 285-287.

The author, in the Macedonian campaign, realizing the well-known disadvantages of gloves and oily applications to the hands for protection against Anopheles, combined the principles of each in thin linen gloves previously impregnated with a faintly-smelling, only slightly volatile, substance. Cresolum saponatum was first used but later crude oil proved to be equally efficient. The gloves are made roomy with a "finger" for the thumb and extend well up the arm. They are wrung out in a piece of rag sprinkled with the oil and thereafter are efficient for a month. The author says that though *A. maculipennis* swarmed in the trenches round Lake Doiran they never even settled on his hands. The advantages of his device are that the protection lasts all night long; that the gloves are neither hot nor irksome and do not interfere with the use of the hand; that smearing the skin is avoided; and that unpleasant smelling substances need not be used.

PUBLIC HEALTH REPORTS. 1921. Sept. 9. Vol. 36. No. 36.  
 pp. 2220-2221. **Prompt Mosquito Control by Use of the Top Minnow, Gambusia.**

"Ichthyologist Samuel F. HILDEBRAND recently made the following report on the prompt control of mosquito production by employment of Gambusia in large numbers:—

'Unusually heavy rains were experienced around Augusta, Georgia, early in July. As a result, many temporary ponds were formed. A pond, covering about one-fourth acre of ground, was observed on July 18 to contain mosquito larvae in countless numbers. Culicine larvae predominated, but many anopheline larvae were also found. The mosquito larvae were uniformly distributed over the pond. Previous to the July rains this depression was completely dry, but it gave evidence of having been under water for a considerable period of time, since aquatic plants, cat-tails, and arrowheads were well established. Smart-weed, Bermuda grass, and foxtail occurred along the edges of the water. On July 19, approximately, 2,000 *Gambusia* were introduced. On the evening of July 20 no wiggletails were visible in open water, but they were exceedingly numerous in the vegetation, where they had gone for protection. On and after July 26 only an occasional small wiggletail could be found.'

"As the fish were obtained from an abundantly stocked pond only about 300 yards distant, they were transferred about 500 at a time in a wooden tub, the work requiring less than half-a-day's time of one laborer. The cost in this instance for complete, prompt and continuous control of mosquito production was not more than \$1."

CONNOR (Michael Edward). **Fish as Mosquito Destroyers: An Account of the Part they played in the Control of Yellow Fever at Guayaquil, Ecuador.**—Reprinted from *Natural History*. 1921. Vol. 21. No. 3. pp. 279-281.

This is an interesting and commendably brief account of the methods to exterminate yellow fever in Ecuador, particularly in the town of Guayaquil. In this city there is a deficient water supply that is only available for two hours per day; consequently there are 7,000 tanks and 30,000 other receptacles in which water is stored. These all breed



Stegomyia. Three fish were tried. Top minnows were delicate and frequently killed by dipping tins. Moreover, they would not eat the larvae because other nourishment could be obtained from the, unfiltered, water. The second fish tried was a kind of perch or "huijas," as they are known locally. This fish used to become restless and jump out of the vessel. Finally, "chata," a kind of sardine, was tried and found very successful. It ate larvae voraciously, dived down to the bottom when anybody approached to draw water and was quite content with its surroundings. At least one per vessel was insisted on by the sanitary authorities.

HOEY (Matthew J.). **West Coast Quarantine Conditions.**—*Proc. Med. Assoc. Isthm. Canal Zone*. 1918. Jan.—June. Vol. 11. Pt. 1. pp. 49–54.

The writer gives an interesting account of the health conditions that obtain in the ports of the west coast of South America. He points out that yellow fever is constantly present in the seaboard towns of Columbia and Ecuador, with Guayaquil as chief disseminating centre. The government of these places has neither money nor trained personnel to combat the outbreaks, nor has it sufficient enterprise to take up the work. Central and Northern America very successfully protect themselves by careful measures of control at these ports carried out by an officer who is a member of the United States Public Health Service. The writer considers that the danger from bubonic plague is much greater than that of yellow fever, for all that has been said about the shortcomings of South American government anent yellow fever applies with even greater force to plague. The disease is much on the increase in the various seaport towns.

MATHIEU (L.). **Une page d'histoire sanitaire maritime: défense contre la fièvre jaune au début du XIX<sup>e</sup> siècle.**—*Arch. Méd. et Pharm. Nav.* 1921. Nov.—Dec. Vol. 111. No. 6. pp. 477–494.

The writer gives a very interesting account of outbreaks of yellow fever at the end of the 18th century in Gibraltar, Brest and Marseilles. The disease was brought from San Domingo originally when the whole of that part of the world was suffering from a terrible epidemic. The report is of value to anyone dealing with the early history of yellow fever in Europe and the methods adopted to prevent its spread.

WILLOUGHBY (W. M.). **Collated Experiences of Plague on Shipboard.**—*Proc. Roy. Soc. Med.* (Sect. of Epidemiol. & State Med.) 1921. Sept. Vol. 14. No. 11. pp. 65–72. (Discussion pp. 72–74.)

In the Sanitation Supplement of June, 1921 (pp. 134–135), we reviewed previous papers by the same writer. This covers the same ground to some extent, but goes into greater detail and gives some valuable information about several outbreaks that occurred in ships coming within the author's cognizance. His figures undoubtedly prove the truth of his statement that the ship's storekeeper is usually the earliest victim, because rats have recourse to the store for their daily food. Lavatory attendants also have been frequently attacked, because rats must have fresh water to drink and it is usually obtainable in these places.

"During 1917-18-19-20, eight ships brought plague infection into the Port of London, and afforded the opportunity for comparisons here laid before you.

<i>Vessel.</i>	<i>No. of cases.</i>	<i>Rating of first case.</i>	<i>Complement.</i>
(1) Sardinia .. ..	7	European storekeeper ..	209
(2) Matiana .. ..	9	Lascar .. ..	—
(3) Somali .. ..	4	European storekeeper and assistant (kept cat) ..	469
(4) Hector .. ..	5	Gunner (storekeeper and assistant later) ..	59
(5) Japan .. ..	4	Lascar ? (kept cat) ..	399
(6) Clan Lamont .. ..	1	Steward .. ..	77
(7) Nagoya .. ..	7	Storekeeper and assistant ..	413
(8) Alps Maru .. ..	2	Storekeeper .. ..	89

"Here, out of over 1,715 persons presumably exposed, with thirty-nine cases of plague, no less than eight of the cases occurred in food storekeepers and their assistants."

The writer then describes the outbreak in each ship and points out that there is, in his opinion, some evidence that a partial fumigation of the hold when full of baggage may actually do harm. With this opinion we are in agreement.

"A weak fumigation by sulphur dioxide is one of the greatest disturbances to which hold rats can be subjected. The vapour pours down any broad channels to the bottom of the hold by mass displacement of air and, if sufficient time and concentration of the gas be used, it is lethal to rats. But on S.S. *Nagoya* passengers were located in the upper "'tween decks," *i.e.*, in the holds, and they returned to their quarters very quickly after the fumigation, thus showing how feeble was the strength or quantity of sulphur dioxide admixture poured in. No doubt it was stronger for a time in the lower parts of the hold—sufficiently strong to kill some rats, perhaps, and to drive out the remainder. The purpose of the French authorities may thereby be served; but the comparison of the three vessels, *Sardinia*, *Matiana* and *Nagoya* shows, I think, that such a measure as incomplete fumigation of holds in the presence of a suspected rat infection is liable to precipitate the human infection which, given time, might or might not otherwise occur."

<i>Name of Vessel.</i>	<i>On Voyage.</i>		<i>At Gravesend.</i>	
	<i>Trapped.</i>	<i>Found dead.</i>	<i>On discharge.</i>	<i>On fumigation.</i>
Sardinia .. ..	—	Seen ?	—	41
Matiana .. ..	42	12	77	15
Somali .. ..	27	80	103	69
Hector .. ..	—	12	16	—
Japan .. ..	—	Seen	16	31
Clan Lamont .. ..	66	Seen	—	19
Nagoya .. ..	—	975	—	—
Alps Maru .. ..	—	Many seen	57	—



"As time has gone on the following measures have commended themselves as a complete programme of precautions :—

"(1) The vessel is moored in the stream pending complete discharge of cargo and complete fumigation.

"(2) The passengers are discharged under 'surveillance.'

"(3) The crew is reduced to a skeleton minimum, and is placed under 'surveillance' or 'observation.'

"(4) The infected quarters, living quarters of the crew and food stores, with all their contents, are subjected to an immediate six hours' fumigation, under a 2·3 per cent. atmosphere of sulphur dioxide (2 lb. sulphur burned to 1,000 cubic ft.).

"(5) The crew standing by the ship is berthed as far as possible from foci of infection (food stores), and the quarters subjected to refumigation at least once a week pending the final fumigation.

"Vaccination is urged on the crew.

"(6) The cargo is discharged under precautions against transfer of rats. Every package is examined from this point of view. Barges are only allowed alongside during daylight hours.

"(7) The workers wear one-piece overalls tied in at the sleeves and ankles against the attacks of fleas, and are under 'surveillance.'

"(8) When empty of cargo the whole of the closed spaces on the ship are placed simultaneously under sulphur dioxide : 2 lb. of sulphur burned to the 1,000 cubic ft. is more than ample for the purpose in view if the spaces are properly sealed. If six hours can be obtained for the disinfection, usually twelve or more can ; the longer the process the more certain the effects as regards fleas and bacteria.

"(9) A deck rat hunt is instituted while fumigation is in progress."

With these findings we do not suppose there will be much disagreement. We would, however, point out that we do not share Dr. Willoughby's views as regards the great importance of an immediate fumigation of the part of the ship most likely to be infected after human cases have occurred. By the time that human plague has manifested itself the infected fleas are either dead or, if in a cold climate, free from infection. If it were possible to fumigate as soon as rats were found dying, and before any human cases occurred, the utility of the precaution would be greatly increased. Also we consider that the author omits some very important points in the epidemiology of ship's plague. The plague commission have shown that the explosive epizootic amongst rats—such as is witnessed in the ordinary rat-infested town in the tropics—only takes place (a) when the climatic conditions favour flea breeding and when the number of fleas per rat is high ; (b) when the climatic conditions give to the fleas their maximum period of infectivity. These two conditions usually coincide in tropical countries.

Further, KUNHARDT and CHITRE have shown that if the plague virus is introduced amongst a rat community when one or both of these two conditions have passed away the disease will not assume the explosive type that burns itself out, but the endemic type ; the infection will be kept alive for months, and will only assume the fulminating appearance when conditions become favourable. Now, from a very long experience of port health work we are strongly of opinion that many of the rat infections on board ship resemble this endemic type, especially if, as not infrequently happens, the boat has left the tropics before the epizootic is complete. Endemic plague amongst ships' rats is much more likely to escape detection than a violent epizootic and is certainly much more to be feared,

because, as KUNHARDT's figures show, the explosive outbreak does not leave any infection behind it, whereas the abortive outbreak will keep alive the infection for a long period of time.

CLEMESHA (W. W.). **Plague on Board Ship.**—*Lancet*. 1921. Dec. 24. pp. 1338-1339.

The author believes that "recent outbreaks of plague in many parts of the world are in all probability re-importations of the disease caused by infected ships' rats," and that these rats escaped destruction owing to "lack of vigilance due to reduced staff, which was a necessary result of the war." He refers to papers by Dr. WILLOUGHBY [see above and this *Bulletin*, Vol. 15, p. 67], Port Health Officer of London. The first person to be infected on these ships has been the storekeeper. "Out of 1,715 persons exposed to infection on eight infected vessels, 39 developed plague; no less than eight of these occurred amongst storekeepers and their assistants." Referring to a paper by Dr. REECE, of the Ministry of Health, Colonel Clemesha quotes him as saying:—"The storekeeper who gets up the food for the native crew and the saloon steward who carries the food from the galley to the saloon are specially liable to infection." It may be extremely difficult to detect plague infected rats on certain ships, because reports show that endozootic plague is fairly common, and Colonel Clemesha is of opinion that "all ships carrying grain, or those in whose cargo food forms a large part, should be Claytonized whenever the ship is empty. For a grain ship to carry rats is a danger to the world."\*

SCHLUPP (William F.). **The Destruction of Rodents by the Use of Poisons.**—*Union of S. Africa Dept. of Agric. Bull. No. 4*. 1921. 34 pp. Pretoria: Govt. Printing & Stationery Office. Reprinted from *S. African Jl. of Industries*. 1920. Sept., Oct., Nov. & Dec. With additions by the author. [Price 3d.]

This pamphlet is the most exhaustive treatise on rat-poisoning that has been published up to date. It deals with practically every poison and every condition under which it is likely to be used. All interested in this subject in tropical countries should obtain copies, because it is quite impossible to do justice to the work within the limits of a review. There are a large number of formulae given, with the good and bad points of each mixture and any special uses that they may possess. Amongst these may be mentioned rain-resisting preparation of grain (poisoned), methods of poisoning lucerne grass, twigs, vegetables, fruit, jams, etc.

"Corrosive sublimate and cyanide are not recommended as rodent poisons. Barium carbonate and squills are not recommended for general use in the field, but they have a special place as poisons for use against rats and mice in buildings. They have several advantages, the principal one being that they are less dangerous to man than the other poisons. . . . .

"For use against rodents in the *field* strychnine should be given preference over the others. This does not mean that good results may not at times be obtained with other poisons. Tens of thousands of rabbits have been killed with phosphorus in Australia. White arsenic has been used successfully on a large scale in rat campaigns

---

\* Summarized by Lt.-Col. J. H. TULL WALSH.



in Japan, the Philippine Islands, and other places. For that matter, the writer has seen good results from the use of lead arsenate, one of the least promising poisons, but this does not alter the comparative merits of the different poisons or the fact that even better results might have been obtained had strychnine been used."

Most of the recipes for house baits are fairly well known. For field work, however, phosphorus is probably less generally used. Grain poisoned with strychnine is best for all-round work.

### *Strychnine Baits.*

"Roughly, these fall into three general groups, viz. :—

"(1) *The Wet or Soaked Grain Bait.*—This is prepared by soaking grain in a solution of one of the soluble salts, such as the sulphate or hydrochloride. This was the earliest form of strychnine grain bait to be used, and it is still employed in various parts of the world, including South Africa. It has given good results against many kinds of rodents, but has been a partial failure against a few others, notably certain ground squirrels. The fact that the poison soaks into the kernels of grain renders it slower in action than a coated grain bait, and makes the bait much less palatable. A great objection to it is that after the bait is prepared, it must be used at once, otherwise it will turn sour. Fermentation can be delayed for a number of hours by the addition of an ounce of borax to each ounce of strychnine used. The soaked bait is a fairly good one. It has been of great service in the past; but, bearing in mind the foregoing remarks, it is not surprising that, as a rule, it has not proved to be the equal of coated grain baits in effectiveness; and being much less convenient, it has largely been supplanted by the latter in North America.

"(2) *The Dry Bait.*—This is a simple bait prepared by dusting crushed grain with powdered strychnine. The alkaloid is to be preferred, although a soluble form can be employed if necessary. The dry bait is a convenient one to use, and is easy to prepare, but it has only a limited application.

"(3) *The American Coated Grain Bait.*—This is prepared by coating the grain with a starchy paste containing strychnine. The advantages of this bait are obvious. Firstly, the alkaloid can be employed. It is considered to be about 20 per cent. more virulent, ounce for ounce, than the soluble salts; and, being insoluble, the bitterness can be more easily disguised. Secondly, the poison is on the outside of the grain; therefore, it is quickly absorbed when the bait is swallowed; there is no waiting for the chemical to be liberated from the interior of the kernels. Thirdly, the grain is dried after the paste is applied, and can then be kept indefinitely and used when desired. The great advantage of this is so manifest that no extended discussion is necessary. . . . .

#### "A Simple Type of Bait. (a) Coated Grain :—

Powdered strychnine alkaloid	..	..	1 ounce.
Baking soda	..	..	1 ounce.
Saccharine	..	..	1 teaspoonful.
Laundry starch	..	..	$\frac{1}{2}$ cupful.
Grain	..	..	10 quarts.

"Add the starch, saccharine, baking soda, and strychnine to one quart of water, heat gently until a clear paste is formed, stirring

continually. Pour the paste over the grain, mix thoroughly so that every kernel of grain is well coated, then spread the latter out and dry it. . . . .

" (b) Coated Grain :—

Powdered strychnine alkaloid .. ..	1 ounce.
Baking soda .. ..	1 ounce.
Saccharine .. ..	1 teaspoonful.
Flour .. ..	3 tablespoonfuls.
Grain .. ..	10 quarts.

" Mix together dry the strychnine, baking soda, saccharine, and flour, then add a little cold water and stir to a smooth creamy paste. Pour this over the grain, mix thoroughly, and spread the grain out to dry. This is one of the late formulae used by the Bureau of Biological Survey against ground squirrels. It will be noted that the paste is not cooked. . . . .

" A Rain-resistant Preparation. (c) Coated Grain :—

#### Part 1.

Powdered strychnine alkaloid .. ..	1 ounce.
Starch .. ..	$\frac{1}{2}$ pint.
Grain .. ..	11 quarts.

#### Part 2.

Plain gelatine (Knox No. 1) .. ..	2 envelopes.
Sodium bicarbonate .. ..	1 ounce.
Brown sugar .. ..	$\frac{1}{2}$ pound.

" Mix the strychnine with one quart of water, add the starch, and stir until it is dissolved, then heat until the starch begins to thicken, stirring constantly. Pour this solution over the grain and mix so that every kernel is evenly coated. Let the grain stand for five or six hours.

" Then make up Part 2 as follows: Dissolve the gelatine in one pint of cold water (use about two ounces of any good plain gelatine), add one pint of boiling water, sprinkle in the soda, stir until it stops foaming, then add the sugar, and when it is dissolved pour the mixture over the grain that has been previously treated with Part 1, mix thoroughly, and spread out to dry."

- i. NEUMARK (Eugen) & HECK (Heinrich). **Ueber Rattenvertilgungsmittel.** [Rat Extermination Methods.]—*Cent. f. Bakt.* 1. Abt. Orig. 1921. Sept. 1. Vol. 87. No. 1. pp. 39-50.
- ii. BAHR (L.). **Ueber Rattenvertilgungsmittel.**—*Ibid.* 1921. Dec. 30. No. 6. pp. 466-470.

i. Neumark and Heck tested many preparations, both of bacteria and of poisons, which have been put on the market for the extermination of rats. In the first group were Rattoleum, Rattenfort, Pogrom, Pestigen, Ratin, Terror, Rattapan, Rattagallin and Maurabazillin. Each substance was examined for its bacterial content and was fed to two or more rats. All were useless for employment in this way, and only two were found to contain the stated bacteria; as a rule the cultures showed only *B. coli* and cocci.



The poisonous substances with the relative advantages and disadvantages of each are discussed, and the conclusion is reached that squill and phosphorus are the most useful. The preparation of attractive and lethal baits of these substances is described. A phosphorus "electuary" prepared by the authors from white phosphorus, rape oil, and flour, and fed to rats, in sausage, killed rats in two to four days, both at once and after ten days keeping. A trade preparation called "Phosphorbrei" was equally effective.

For the squill experiments the mince of freshly bought bulbs was extracted with 60 per cent. alcohol in the proportion of 1 : 5 for six days and then squeezed through a cloth. Small pieces of bread were soaked in the yellowish fluid extract and fed to two rats, which died on the second day. Several proprietary preparations of squill proved ineffective, but a squill extract, called Ratinin, promptly killed the rats which took it. [In none of these experiments is it stated whether the rats took the bait from choice or for want of other food.]

The author concludes that both phosphorus and squill are effective. The phosphorus baits should contain plenty of fat both for immediate effectiveness and keeping quality. Squill preparations should contain the fluid extract rather than solid portions of the bulb. The authors express their preference for phosphorus.

[Barium is nowhere mentioned, nor do the authors give any figures showing which vehicle for the poison is the most attractive to rats. This is of great importance in campaigns. See work of KUNHARDT and CHITRE.]

ii. Bahr agrees with NEUMARK and HECK in their demand that bacterial rat poisons should be submitted to competent laboratory control before being put on the market, but considers that they have not made out a case for the worthlessness of all preparations labelled pure cultures, owing to the paucity of their animal experiments. Four rats for one experiment is far too few. Only a certain proportion are susceptible to such organisms and some strains of rats are practically immune. In experiments of his own, done in 1905, in which Ratin was under investigation, 166 rats from 16 different places were used; 114 died, but in a certain batch only one out of ten. Experiments on Ratin under the auspices of the Swedish Government in 1921 gave 94 per cent. of deaths among the rats which took it. Owing to this varying susceptibility of rats, Ratinin, a preparation of squill, has been used in Denmark in addition to Ratin since 1905. Each supplements the deficiencies of the other. He claims that this, the "Ratin system," has had great success in many lands. NEUMARK and HECK's recommendation of phosphorus shows that they are unfamiliar with working conditions. Squill is far preferable, but the activity of each sample must be tested, because some contain little or none of the poisonous principle.

THE SURVEYOR & MUNICIPAL & COUNTY ENGINEER. 1921. Oct. 7.  
Vol. 60. No. 1551. p. 241.—**The Rat Scourge. Sanitary  
Extirpation Methods.**

*The Use of Squills.*—"In this connection, Mr. E. G. Boulenger, F.Z.S., of the Zoological Gardens, says, 'As a result of our investigations we have no hesitation in coming to the conclusion that squill

solution is the most effective rat poison, and recommend its use in preference to barium carbonate for the following reasons: (1) That for rodents it is three times as toxic; (2) that it is even less harmful to most domestic animals.'

"The squill solution here referred to is none other than 'Ratinol,' which is a preparation distilled from squills, and has the merit of not being only cheap but is, if applied with due care, quite harmless to domestic animals and birds. The chief advantage of this preparation is that, the action being toxic, no sooner is the bait consumed than a thirst is immediately created, and rats are compelled to seek water and fresh air, so that, as a rule, no dead rats are seen."

HARRISON (W. T.). **Typhoid Outbreak originating in a Carrier. Outbreak on Steamship shows Importance of Thorough Examination before Discharge of Typhoid Patients.**—*Public Health Rep.* 1921. Sept. 16. Vol. 36. No. 37. pp. 2255-2257.

The circumstances of this outbreak are as follow: A fireman joined the ship one day after his discharge from hospital. At the time of investigation, some weeks later, his urine still contained a pure culture of *B. typhosus*. The carrier in question did not have anything to do with the cooking, but it was found on investigation that all his messmates washed in the same bucket and used the same towels and handled pans, cups, etc., in the manner customary in a ship's fore-castle. Ten cases were infected. Eight of them were the carrier's own messmates, one other was the mess-boy and the tenth the bosun, who worked largely with the fore-castle crew. No cases occurred amongst the other members of the crew who lived in other parts of the ship.

HULL (Thomas G.). **Antityphoid Vaccination.**—*Public Health Rep.* 1921. Sept. 23. Vol. 36. No. 38. pp. 2312-2316.

This report gives some very valuable figures of the results attained by antityphoid vaccination in the American Army and its effects on the figures in the U.S.A.

Table I.

*Vaccination against Typhoid in United States Army.*

Year.		Persons Vaccinated.	Cases of Typhoid.
1908 ..	Voluntary .. .. .	0	239
1909 ..	" .. .. .	830	282
1910 ..	" .. .. .	16,093	198
1911 ..	" .. .. .	27,720	70
1912 ..	Compulsory .. .. .	40,057	27
1913 ..	" .. .. .	25,086	4
1914 ..	" .. .. .	36,902	7



Table II.

*Rate of Typhoid Fever in the Army and in the corresponding age group in civil life.*

Year.	Death rate per 1,000 in Army.	Death rate per 1,000 in civil life (ages 20 to 29 years).	Year.	Death rate per 1,000 in Army.	Death rate per 1,000 in civil life (ages 20 to 29 years).
1900 ..	0.43	0.46	1910 ..	0.16	0.27
1901 ..	.64	.42	1911(b) ..	.09	.23
1902 ..	.86	.40	1912 ..	.04	.18
1903 ..	.28	.35	1913 ..	.00	.18
1904 ..	.27	.33	1914 ..	.03	.15
1905 ..	.30	.32	1915 ..	.00	.18
1906 ..	.28	.32	1916 ..	.03	.12
1907 ..	.19	.28	1917 ..	.03	.11
1908 ..	.23	.28	1918 ..	.05	.09
1909(a) ..	.28	.23			

(a) Voluntary vaccination against typhoid in Army.

(b) Compulsory vaccination against typhoid in Army.

Table III.

*Typhoid epidemic in Hawaii in the fall of 1917.*

Troops.						Case rate per 1,000.	Death rate per 1,000.
Vaccinated ..	..	..	..	..	..	13.45	0.97
Unvaccinated ..	..	..	..	..	..	55.41	8.62

..... "Out of the 4,000,000 troops in the World War, there occurred 213 deaths from typhoid. If the rates in previous wars had been obtained, this figure would have been multiplied several hundred times." .....

Table IV.

*Relation of mortality from typhoid fever in the World War to that of previous wars.*

Deaths from typhoid fever in the World War .. .. .	213
Deaths that would have occurred if Civil War rate had obtained	51,133
Deaths that would have occurred if Spanish War rate had obtained	68,164

..... "It would be expected, however, that the several millions of men in the Army who were vaccinated would show a lowered typhoid rate over prewar rates for the same age group. This is exactly what happened." .....

Table V.

*Reduction of typhoid rate in ex-service men over prewar rates.*

	Typhoid rate, 1911-1916.	Typhoid rate, 1919.	Per cent. decrease.
White men, 20-35 years .. ..	22.3	8.0	64
White women, 20-35 years .. ..	14.9	7.9	47

Table VI.

*Effect of typhoid vaccination in ex-service men in typhoid epidemic in Salem, Ohio.*

	Per cent. contracting typhoid.
Female population of Salem between 20 and 30 years .. ..	12.5
Ex-service men in Salem (210) .. ..	1.4

FLU (P. C.). **Onderzoekingen over den levensduur van cholera-vibrionen en typhus-bacteriën in septic tanks te Batavia.** [Researches on the Duration of Life of *Vibrio cholerae* and *Bacillus typhosus* in Septic Tanks at Batavia.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1921. Vol. 61, No. 3. pp. 288-293.

After artificial infection of the contents of different septic tanks with the two pathogenic organisms mentioned in the heading both could be easily detected in the effluent of the tanks after a few hours. Cholera vibrio was less resistant than the typhoid bacillus, the former being detectable after not more than 24 hours, the latter after three days. The germs are mechanically transported by the current in the tank. High temperature seems to be favourable to their duration of life.

These results confirm the views of CALMETTE and of GRIJNS and EIJKEN, and emphasize once more the opinion that septic tank effluents should not be allowed to flow off immediately into public waters.\* [HOUSTON came to the same conclusion about 1896. Experiments performed in India show that the higher the temperature of a water or effluent the faster *B. typhosus* disappears from the fluid.—W.W.C.]

BOYD (Mark F.). **The De-lousing Measures of the Santa Fé Railway System.**—*Amer. Jl. Public Health*. Vol. 7. No. 8. pp. 667-671. With 2 figs. in text.

Typhus fever was introduced into Fort Madison via Santa Fé by a Mexican labourer. As most of the staff on this section of the line were Mexican, and many of the quarters as well as the men had become lousy, it was necessary to cleanse the whole lot.

Arrangements were made to do this by means of a train disinfecting and bathing equipment. Dry heat was used instead of moist steam,

\* Summarized by Dr. W. J. BAIS.

as in Mesopotamia, and baths were prepared in tubs by heating water with engine steam. Kerosene and soap were used to kill the lice on the body at the time of the bath, and kerosene and vinegar for the hair. Whilst the occupants of the houses were bathing, the quarters, which were usually derailed bunk cars, were treated.

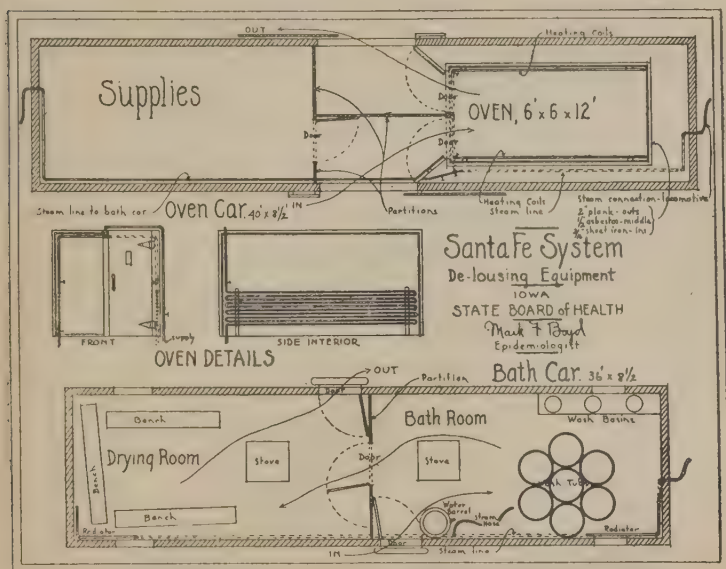


FIG. 5.—Arrangement of Oven Car for sterilization of clothing and bedding, and of Bath Car as bath room and drying room, Santa Fé Railway, U.S.A.

(Reproduced from the *American Journal of Public Health*.)

FAICHNIE (N.). **Means of Infection in Fly-borne Disease.**—*S. African Med. Rec.* 1921. Nov. 26. Vol. 19. No. 22. pp. 438-441.

"To summarize what I have said: It is a common experience to find, on the one hand, grossly insanitary conditions, together with very numerous flies bred from manure, and little disease, and, on the other hand, with comparatively few flies, but these bred from faecal matter, enormous outbreaks of enteric, which may and do occur amidst sanitary conditions apparently good. I contend that the reason for this is that it is only the excrement of faecal bred flies that can cause enteric fever or bacillary dysentery to any great extent. These flies become infected in their larval stage, consequently the place where they are bred is a matter of far greater importance than the food they feed on. The most important source of faecal bred flies are night-soil pits. Individual faecal deposits do not, as a rule, breed flies but, under favourable circumstances, as in ash pits or manure heaps, they may. 400 flies have been bred from one single human evacuation.



"If there be any truth in these conclusions our policy with regard to flies should be quite clear. First and foremost, where water drainage is not available, flies must be prevented from breeding in faecal matter by incineration, deep or shallow trenching properly carried out, or modified septic tanks.

"Secondly, refuse suspected of containing faecal matter also should be disposed of by incineration or in destructors.

"These two vitally important matters having been accomplished, the difficult and almost hopeless task of stopping the breeding of flies in manure may be begun."

The above summary of the article shows the line of argument taken by the author. Whilst we are prepared to admit many of his premises, such as that flies bred in human faeces are more likely to carry intestinal disease than those bred in horse-dung, we do not think that he takes a sufficiently wide view of the subject. All enteric is not fly borne. Thus, the decline in enteric brought about by installing a sound water supply is well known and thoroughly proved. Also, the great falling off in the incidence of enteric in India when all cases that were temporary carriers after an attack were kept apart until they were free from bacteria is now beyond dispute. Both these important points are omitted. The paper is interesting and suggestive.

GRENADA. [**Intensive Treatment of Yaws.**].—Minute from Colonial Surgeon (Dr. G. V. PATERSON) to Colonial Secretary, dated 10th August 1921. [Received from the Colonial Office.]

Return in respect of the intensive treatment of yaws for the half-year ending June 30, 1921.

New cases seen .. .. .	1,477
Total cases seen .. .. .	3,263
New cases injected .. .. .	1,474
Total cases injected .. .. .	1,666
No. of cases discharged cured .. .. .	2,412
No. of deaths .. .. .	1
No. of tubes of Novarsenobillon used .. .. .	2,920
Value .. .. .	£459 18s. 0d.

DINGLE (P. A.). [Principal Medical Officer, North Borneo.] [**Incidence of Beriberi.**] Extract from Report, dated June 1921. [Manuscript.]

"With regard to beriberi on estates, there has been a great decrease in the incidence of this disease during the last three years, as shown by the following figures :—

Year.	Average Labour force.	Total cases treated.
1918 ..	19,891 ..	1,519
1919 ...	20,801 ..	396
1920 ..	21,120 ..	169

"There is no doubt that the inauguration of the Food Control, with the decrease in the rice ration and the substitution of other foodstuffs, such as wheat, sago, tapioca, sweet potatoes, etc., has been the principal factor in the marked decrease, and a paper by the Principal Medical Officer of the Federated Malay States has lately been published in the *Indian Medical Gazette* showing a similar decrease throughout the Malay States.

"I was hoping that the labouring class would have realised the advantages of the substitution of other foodstuffs for a portion of the rice ration, but I am afraid this is not so ; since the decontrol of rice there has been a difficulty in obtaining sweet potatoes on this Coast, which is significant of the fact that there is no longer much demand, and that the majority of people are once more consuming the full rice ration ; and in consequence there will be, I feel sure, an increase in the incidence of beriberi this year."

BIHAR and ORISSA. **Administration Report on the Jails of Bihar and Orissa for the Year 1920.** [GILLITT (W.), C.I.E., M.D., I.M.S., Inspector General of Prisons, Bihar and Orissa.]—pp. 19 + lxxxix + 4. 1921. Patna: Supt., Govt. Printing. [Price Rs. 5, As. 12.]

"Energetic measures were immediately taken to treat all prisoners known to be harbouring the hookworm and the results have been startling. Not only has the general level of health been markedly raised, but in addition bowel diseases have been almost eliminated from the jail.

"It is probable that investigation in other jails, especially those in the north of the province, will give somewhat similar figures."

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## CONSERVANCY.

KLIGLER (I. J.). **Investigation on Soil Pollution and the Relation of the Various Types of Privies to the Spread of Intestinal Infections.**—*Monographs of the Rockefeller Institute for Medical Research.* 1921. Oct. 10. No. 15. 75 pp.

The writer of this monograph makes an attempt to put on to a scientific basis the avoidance of dangers that have long been considered to exist from certain doubtful methods of conservancy.

"The methods of disposal usually employed in rural communities fall into four main types: (a) the open back privy; (b) the pit privy; (c) the pail type; and (d) the septic tank. Occasionally the chemical closet is also used. Some of these so-called sanitary closets are unquestionably dangerous; others have their respective advantages and degrees of usefulness. None of them can reasonably be considered as satisfactory as the urban sewerage system method of disposal. But the potential or actual danger involved in the use of one or another type is purely a matter of conjecture."

After a review of the literature up to date, he proceeds to investigate such points as the persistence of *Bacillus typhosus* and *dysenteriae* in the soil and in faeces in a septic tank, and the penetration of bacteria into the soil. These points are made the subject of very careful laboratory experiments, the results of which are given in full in the report.

*General Summary of the Laboratory Investigations on Viability and Penetrability through Soil of Typhoid and Dysentery Bacilli.*

"The experiments detailed above are not exhaustive and do not warrant any sweeping deductions. It seems convenient at this point, however, to summarize the main facts as observed in order to discover their possible interrelation.

"1. In *feces* the typhoid bacilli were recoverable up to the tenth day and not thereafter; the dysentery bacilli up to the eighth day. The survival period is shorter in loose than in solid feces. These results are in accord with those reported by Gärtner, Park and Kruse.

"2. In *pit* material kept dry by the addition of powdered soil, the typhoid and dysentery bacilli were not recovered on the 10th and 4th days, respectively, while the paratyphoid B. bacillus was recovered on the 10th, but not on the fifteenth day. These results differ from those obtained by Galvagno and Calderini, who recovered typhoid bacilli after 15 to 30 days, but these authors experimented with ordinary pits without the addition of soil, and the difference in moisture may account for the differences in results.

"3. In *septic* fluids the reaction is the important factor in controlling the viability of typhoid and dysentery bacilli. When the reaction was pH. 7.4-7.8 the typhoid bacilli could be recovered on the fourteenth day, and the dysentery bacilli on the eighth day. When the reaction was pH. 8.6 or over, the bacilli died out more rapidly and were recovered only on the fifth and third day, respectively.

"4. In *soil* the typhoid and dysentery bacilli behaved alike. The main factors influencing their viability were the moisture content and the reaction of the soil. In moist soil the inoculated bacteria might survive for 70 days, although the greater number (about 90 per cent.) of them died within 30 days. In dry soil the bacteria were not recovered on the twentieth day. In acid soil (pH. 5.0-5.5) the typhoid and dysentery bacilli were almost all dead on the tenth day, irrespective of the moisture. These results are in general accord with those of previous investigators



(Dempster, Pfuhl, Firth and Horrocks, Mair), and also explain the variations in the figures obtained by various authors. Part of the antagonistic action of the soil may be due to inhibitive substances produced by other bacteria. Such substances have been found in broth cultures of *Bacillus fluorescens* and *Bacillus proteus*. But in the main the reaction of the soil and the amount of moisture are the significant elements.

"5. The typhoid and dysentery bacilli do not spread either laterally or otherwise through the soil unless carried mechanically by water. The direction of penetration is in the direction of the flow of the water. In relatively porous soil the bacteria were carried through a depth of 2, but not 3 feet. In compact soil the bacteria were not carried through 9 inches of soil. Although these experiments were somewhat different in character from those reported by Firth and Horrocks and by Robertson, the findings are similar to theirs."

This forms the first half of the work. The second is much more interesting from the point of view of a practical sanitarian. This contains a careful series of experiments performed in the field in South Carolina in order to elucidate such points as to how far the ground may be said to be contaminated by leakage from an ordinary cesspit and septic tank, and how far ground water is likely to be polluted from this source. These results are of great importance, because they are the first attempt we know of to prove, what many practical men have always held, viz., that in an open well very little pollution enters through the soil, whereas most comes in through the open mouth, and secondly, the great superiority of the tube well over the open shallow well.

*Summary of the Investigations on the Pit Privy.*

"The examination of over 50 pits in different soils during dry and rainy seasons brought to light a number of interesting facts.

"1. In the cultivated area, surface soil, to a depth of 1 to 2 feet, is invariably polluted. Subsoil below this depth, except near a pit, is generally free from contamination. This makes it possible to trace pit pollution of subsoil by means of soil borings.

"2. During dry seasons, whatever the age of the pit, pollution extends in a downward direction from the base of the pit for about 3 feet. This applies to clay, sand-clay, and sandy soils. The soil above the bottom of the pit, even 1 to 2 feet from the pit wall, is free from pollution, showing that there is no lateral extension of pollution.

"3. During rainy seasons the pollution of the subsoil is more abundant, but the indications are that most of it is derived from the surface, the pit pollution extending to only about 5 feet from the pit. Sandy soils show more extensive subsoil pollution during rainy seasons than do other soils.

"4. The study of the relation of the purity of the well to the type of privy substantiates the idea that the pollution from the privy does not penetrate through the soil. Most of the pollution in wells, in the soils mentioned, is apparently surface pollution. Driven or drilled pump wells were largely free from pollution. Open dug wells, on the other hand, were all more or less contaminated. The difference in the non-lactose-fermenting bacilli isolated from polluted wells and soils is a further indication that the well pollution is probably different in origin from that in the soil near pits.

"5. A careful study of the soil and well pollution with experimental pits confirmed the deductions from the field studies. In this experiment there was no evidence of pit pollution in wells 25 and 40 feet from the pit. Soil tests showed that pollution may extend about 5 feet from the pit. The pit was used for 5 months by about 50 children.

"6. These results and those obtained with two septic pits suggest that the important point to be considered in connection with the building of

pit privies is the level of the ground-water. The vertical distance between the bottom of the pit and the ground-water is of greater significance than the horizontal distance between the pit and the well."

. . . . .  
*Summary of the Studies on Kentucky Sanitary Privy.*

"1. The Kentucky sanitary privy if properly constructed and properly operated gives a darkly colored slightly turbid effluent free from solid fecal matter after it has been in use 6 months. This effluent has a reaction of pH. 7.7-8.0 and is rich in *Bacillus coli*. *Bacilli dysenteriae* and *Bacillus typhosus* inoculated into the effluent die out within 1 to 4 days, respectively, if the mixture is kept in the dark at 28-30°C.

"2. Experiments designed to demonstrate (a) the ability of typhoid bacilli to pass from the septic chamber to the drain-pipe in a few days, and (b) the subsequent passage of pollution from the drain to the well gave negative results.

"3. Tests of soil specimens and of well waters confirmed the results obtained in connection with the studies of the pit privy. Pollution from the tiles does not, as a rule, penetrate the soil to a depth greater than 3 feet. The extent of the pollution of well water depends more on the condition of the well than on the type of privy or its proximity to the well.

"These deductions may also reasonably be applied to other privies of the same class, provided they are so constructed as to comply with the conditions of these experiments."

COX (C. L.) & BRUCE (A.). **Sewage Disposal in Colombo.**—*Jl. Roy. Sanitary Inst.* 1921. Nov. Vol. 42. No. 3. pp. 188-192. With 2 figs.

"Colombo, Ceylon. Population, 250,000. Rainfall, 80 inches. Mean temperature, 80° F. Mean humidity, 80 per cent. Area, 8,617 acres. 3,485 acres fully provided with sewers, 1,623 acres with arterial sewer system, 617 acres no sewer system, and 2,892 acres of lake, swamp or not habitable.

"The first instalment of the disposal works, opened in 1910, consisted of four septic tanks, 240 ft × 13 ft. × 10 ft. deep (12 hours' flow thorough capacity), with a 26 ft. detritus tank at the head of each. Eight circular aerobic beds and two storm-water settling tanks and two percolating filters. The instalment was designed to serve an ultimate population of 60,000 with a dry weather flow of 1,500,000 galls. Storm flow up to twice this amount was dealt with by the septic tanks and aerobic beds and the remainder up to six times the dry weather flow by the storm tanks and filters.

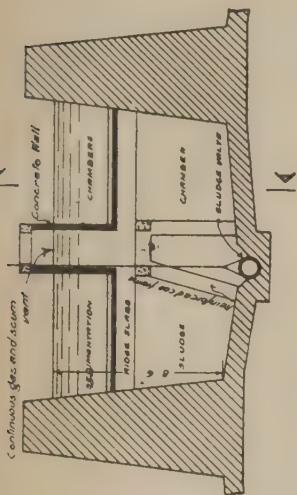
"The septic tanks were originally covered with a corrugated iron roof, but this was removed to prevent mosquito breeding. The mean temperature of the sewage in the tanks is 85° F.

"The early sewage was weak, but gasification and intense ebullition caused masses of sludge to be disgorged with the tank effluents. The aerobic beds quickly ponded and were put out of use. The material in the storm filters was removed and they were converted into additional storm tanks.

"As the result of extended experiments it was determined to convert the septic tanks into two-storey sedimentation tanks.

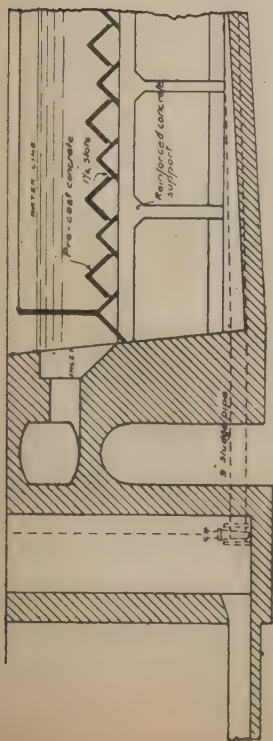
"In No. 1 tank, this was effected by longitudinal concrete slab divisions sloping from a continuous slot at each side wall to a continuous vent or scum opening in the centre (Diagram 6, Fig. 1).

COX & BRUCE.]



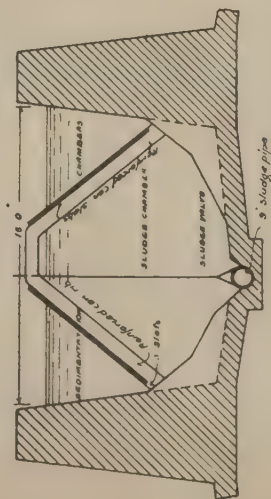
CROSS SECTION OF N° 2 TANK

FIG 2



LONG SECTION OF N° 2 TANK AT A.A.

FIG 2



CROSS SECTION OF N° 1 TANK

FIG 1.

COLOMBO MUNICIPALITY  
MADAMPITIYA TREATMENT WORKS

SCALE 1/4 IN. = FOOT



DIAGRAM 6.—Showing methods of conversion of septic tanks into two-storey sedimentation tanks.  
(Reproduced from the *Journal of the Royal Sanitary Institute.*)



"In No. 2 tank, separation between sedimentation and sludge chambers was effected by pre-cast concrete A-shaped divisions placed laterally across the tank and forming a series of ridges and valleys through its length. The settling solids pass through slots in the valleys (the edges of adjoining slabs overlap) and the lateral divisions are divided at the centre of the tank by a continuous vent and scum chamber with which the underside of each ridge communicates (Diagram 6, Fig. 2)."

"Table B.—Typical results from altered tanks with an ordinary dry weather sewage flow.

<i>Suspended Solids. Parts per 100,000.</i>			
	<i>Volatile.</i>	<i>Non-volatile.</i>	
Sewage .. .. .	30	..	17
Inlet to Sedimentation Tanks	17	..	8
Combined Effluent from Sedimentation Tanks .. ..	5	..	1.5

"Considerable reduction of suspended solids occurs before entry into the tanks. This is due partly to settlement but chiefly to scum formation in the detritus tanks and inlet channels, which require clearing at frequent intervals."

RICHARDS (Eric Hannaford) & WEEKES (Michael George). **Straw Filters for Sewage Purification.**—*Surveyor*. 1921. July 15. Vol. 60. No. 1539. pp. 47–48. (Discussion p. 48).

The writers point out that practically all the nitrogen in sewage is wasted and that any method that would return a certain percentage of it to the land would be a very decided improvement on present practice. They consequently experimented with straw as a filter medium, being aware (from experiments made at Rothamsted) that if an ammoniacal liquor is passed over this material it will retain a large proportion of the ammonia until it becomes saturated. Then the material was stored in heaps (which caused a further increase in the N available) and could be used as manure as required, fresh straw being applied.

"The laboratory experiments which led to the construction of the straw filter at Wainfleet were briefly these :—

"A dilute solution of ammonium carbonate, of strength equal to a very strong sewage—i.e., 10 parts of nitrogen per 100,000—was passed through a percolating filter of wheat straw at the rate of 250 gallons per cubic yard of straw per day. On the first day 5 per cent of the nitrogen passed on to the filter was removed, the amount increasing steadily up to the twentieth day, when only 1 per cent of the nitrogen in the artificial sewage was found in the effluent, the remaining 99 per cent. remaining in the filter. The filter was then mature and continued to remove practically all the nitrogen fed to it until the saturation point was reached.

"In the case of wheat straw the filter continued to remove nitrogen until 7 parts had been fixed per 1,000 parts of dry straw. On dismantling the filter the straw was found to have retained 86 per cent. of the nitrogen contained in the original ammonia solution.

Twenty per cent. of the dry matter in the straw had disappeared in the process of fixation, so that the nitrogen in the final dry matter had been raised to 1·33 per cent.

“The effluent was brown coloured but non-putrefactive. It contained too much carbonaceous matter in solution to pass the Sewage Commission’s test for dissolved oxygen absorption. When the straw filter effluent had run through an ordinary clinker percolating filter, an effluent was obtained that would pass both the standard tests, but was still very brown in colour.

“The experiment was then repeated with actual sewage from the Harpenden Works. The results were the same as in the first experiment.

LABORATORY STRAW FILTER AND AMMONIUM CARBONATE.

Nitrogen Balance.

	Grammes.		Grammes.
Nitrogen added as (NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	1·400	Nitrogen in effluent	.. 0·121
Nitrogen in straw at start	.. 0·759	Nitrogen in straw at end	.. 1·965
		Nitrogen lost (3·4 per cent.)	0·073
	<hr/> 2·159		<hr/> 2·159

Amount of added nitrogen fixed 86 per cent.

LABORATORY STRAW FILTER AND SEWAGE.

Nitrogen Balance.

	Grammes.		Grammes.
Nitrogen as NH <sub>3</sub> in sewage	.. 1·532	Nitrogen in effluent	.. 0·149
Nitrogen in straw at start	.. 0·877	Nitrogen in straw at end	.. 1·976
		Nitrogen lost (11·8 per cent.)	.. .. 0·284
	<hr/> 2·409		<hr/> 2·409

Amount of added nitrogen fixed 72 per cent.

“When the straw has become saturated with nitrogen it can be removed from the filter, and if stored in heaps will continue to ferment with great improvement in its physical state regarded as a substitute for farmyard manure.

. . . . .

“The original experiments had made it clear that clean straw was not active in removing nitrogen, but that it gradually became more so as sewage was passed through it, the best results being obtained after 20 days of treatment; for this reason it was decided that the filter must be in sections and that the straw must be passed from section to section so that the sewage always met the newest straw first and finished by passing through the most active section. It was also decided that three sections would be sufficient, as this would give one section fully active and another nearly so, when clean straw had to be added. The first intention was to construct three shallow beds arranged in steps, but when the details came to be got out, it was found that the head required to give three systems of distribution was too great to make the scheme practicable, and further that there would be considerable labour in forking the straw from one bed to the next.

" Finally a filter was constructed as follows : An angle-iron frame-work, 20 ft. long, 10 ft. wide and 7 ft. 6 in. high, was fixed over a sloping concrete floor, with two main horizontal members, one 2 ft. and the other 4 ft. 6 in. above the floor, passing along each side. On these members 1 in. diameter galvanised iron pipes, 12 ft. long, were laid, spaced at 4 in. apart, centre to centre ; the length of the pipes allowed them to project 12 in. beyond the frame-work at each end to give hand-hold for drawing.

" Transverse horizontal angle-irons were fixed across the bed 3 ft. above the upper of the two floors so formed, to tie the verticals together and also to carry the distributing troughs. Two V-shaped wooden troughs were laid over the filter, the sides having notches about 12 in. apart with a nail driven under each to act as a drip point.

" This type of construction made it very easy to pass the straw from section to section of the filter. When the ripest straw had been raked out from the bottom layer, the attendant would begin at one end and draw out each pipe in turn until the whole of the straw that had been the second layer had fallen on to the concrete floor. He would then replace the pipes and draw those from under the top layer, letting that down in turn. The upper pipes were then replaced, and the new straw unloaded from the carts on to them.

" No trouble was experienced in pulling out the pipes, as the friction against the wet straw was very slight."

" When a new tank of 960 gallons capacity was installed, the improvement in nitrogen recovery was very marked. The best figure recorded was 65 per cent of the nitrogen in the sewage. On incubation for five days the effluent was invariably putrid. From such a strong liquor, ten times as strong as normal sewage, it is probably impossible to produce a non-putrescible effluent by straw filtration alone.

#### WAINFLEET STRAW FILTER.

Average analyses of samples taken after installation of larger overhead tank, July-September, 1920.

	Parts per 100,000.	
	Sewage.	Effluent.
Ammoniacal nitrogen .. .. .	18.92	10.19
Oxygen absorbed in four hours from per- manganate .. .. .	31.88	20.82
Dissolved oxygen taken up in five days ..	80.4	14.9
Chlorine.. .. .	31.0	39.3
Dry matter. Per cent.		
Total nitrogen in raw straw .. .. .	..	0.50
" " in straw removed from filter ..	..	1.62
" " after storage for six months ..	..	2.06

" In order to recover all the nitrogen possible about 2 lb. of dry straw per man per day is required."

Filters of this kind could easily be erected in all hot climates and would be useful for small installations, provided, of course, the local agriculturists could be educated up to use the manure when it was produced.



BELL (Herbert D.). **The Maintenance of Clean Filtering Medium in Sewage Filters.**—*Surveyor*. 1921. Nov. 18 & 25. Vol. 60. Nos. 1557 & 1558. pp. 345-346 & 375-376. With 1 fig in text.

The writer of this paper is manager and chemist at Barnsley Sewage Works. In the course of his work he has made a study of the insect life in sewage filters and has discovered that, if the eggs of a small insect, *Achorutes viaticus*, are inoculated into the mass, when the larvae have become numerous in the filter medium the filters never clog or pond and do not require forking over; further, that beds in which the insect is living vigorously give a higher percentage of purification than those from which the larvae are absent. The beds will also, as would be expected, deal with a larger quantity of sewage in 24 hours.

The paper itself deals with the discovery from the point of view of the sewage manager and not the zoologist. Details of the life-history of the insect are very meagre. Apparently it is not always an easy matter to re-infect new beds, but with a little care this can be done. Some infected filter medium is packed into a biscuit tin with loose green grass—the latter ensures moisture and air during carriage. On arrival the egg-laden medium is carefully placed in a small depression in the filter to be inoculated. From this centre the whole mass gradually becomes infected.

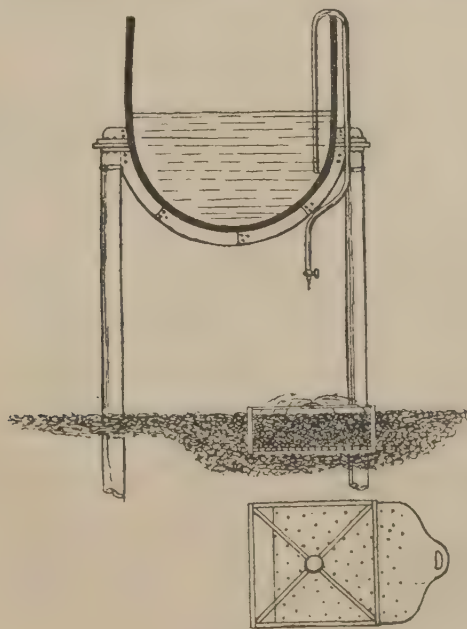


FIG. 7.

Method devised by Mr. F. W. HARRIS of inoculating *Achorutes viaticus* into filter medium.

(Reproduced from *The Surveyor*.)

“Mr. F. W. Harris, of Glasgow, has devised a better method of inoculation, consisting of a shallow wooden box with a perforated

loose bottom 1 ft. square by 6 in. deep. This box is filled with the same medium of which his large filters are composed, and is suspended immediately below his experimental filter. The latter is colonised by the liquor which passes through the experimental filter, as it carries with it small insects, white casts (or sheaths) and eggs, and thus colonises the medium in the box. Mr. Harris finds that it takes about three weeks to effect colonisation of the medium in the wooden box, and when this time has elapsed he transfers the box to one of his large filters, making a cavity in the surface of the media large enough to take the box. The box is then put into the cavity, the media levelled up on three sides, the loose bottom drawn out and the media levelled up against the fourth side. The four sides are then lifted up, and inoculation is thus made with the least disturbance of the media. As the liquor is sprayed on to this media the insects are washed out into the media immediately below, and colonisation commences in the large filter. Mr. Harris adopts this process also for cleaning up dirty portions of the media, and I consider that it is a very good way to assist colonisation with the least number of 'casualties.' It is, of course, necessary first to establish the insects on an experimental filter."

[The author kindly sent some of these insects to the writer of this review. They survived a journey by post. They are a variety of springtail, and are called *Poduræ* in some Zoology Books.—W.W.C.]

THE SURVEYOR & MUNICIPAL & COUNTY ENGINEER. 1922. Jan. 6.  
Vol. 61. No. 1564. pp. 5-6. **Sewage Disposal at Manchester.  
Operation of Large-Scale Continuous Flow Activated Sludge  
Plant.**

The average analytical returns are as follows :—

RESULTS IN GRAINS PER GALLON.

	Screened and Detritus-free Sewage.	Effluent.
Four hours' Oxygen Absorption .. .. .	2.54	.49
Three minutes' Oxygen Absorption :—		
Before Incubation .. .. .	.93	.21
After Incubation .. .. .	—	.20
Putrescibility .. .. .	—	3½/213
Free and Saline Ammonia .. .. .	2.16	1.36
Albuminoid Ammonia .. .. .	.50	.12
Nitrite (in terms of NH <sub>3</sub> ) .. .. .	—	.02
Nitrate (                    ) .. .. .	—	.53
Dissolved Oxygen Absorption (*Royal Commission Test) .. .. .	—	1.00
Average daily flow (gallons) .. .. .	241,000	
Cubic feet free air per gallon Sewage treated ..	1.38	

\* Standard recommended .. .. . 1.40

"Reference has been made previously to the occasional difficulty which has been experienced in the efficient settlement of the sludge, due, apparently, to sudden alteration in the physical character of the sludge, which at infrequent intervals has shown a tendency to increase in bulk to an abnormal extent. Attention has been paid to this problem during the last year, and observations made under working conditions, together with periodic microscopic examination of samples of sludge, tend to confirm the previously expressed opinion that this abnormal condition of sludge is due primarily to low air supply. It would appear that a low air supply over a prolonged period brings about conditions, probably arising from the incomplete activation of fresh sewage solids, favourable to the growth of the higher organisms. Considerable growths of 'Carchesium' and 'Stentor' have been found in the sludge when in this abnormal condition.

"During the obligatory stoppage of this tank the opportunity was taken of thoroughly cleaning the aëration chamber. On the whole, the diffusers, which had been in continuous operation for 3½ years, were in a satisfactory condition, and it was not found necessary to renew any by reason of indifferent diffusion. No evidence has been obtained up to the present of any material choking effect—the friction of the tiles showing no appreciable increase.

#### *Davyhulme Works Results.*

"The following is a summary of the results obtained at the Davyhulme works:—

Total flow of sewage—

Main outfall, 18,512,389,000 gallons }	= 18,528,659,000 gallons.
Point "E" 16,270,000 " }	

Total sludge removed .. .. = 217,574 tons.

= 11·7 tons per million gallons.

Cost of sludge disposal .. .. = £31,321 3s. 8d.

= £1 13s. 9·4d. per million gallons.

Total volume of sewage filtered (primary contact beds and storm beds) .. ..

= 9,764,390,000 gallons.

= 53 per cent. of the total sewage flow.

Total volume filtered by secondary beds .. ..

= 5,119,786,000 gallons.

= 62 per cent. of the primary effluent.

= 28 per cent. of the total sewage flow.

Cost of filtration .. ..

= Total, £40,951 1s. 9d.

Maintenance, £11,618 8s. 4d.

Renewals, £29,332 13s. 5d.

= Total. Maintenance. Renewals.

£	s.	d.	£	s.	d.	£	s.	d.
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Per million gallons sewage flow	2	4	2·4	..	0	12	6·5	..	1	11	7·9
---------------------------------	---	---	-----	----	---	----	-----	----	---	----	-----

Per million gallons, filtered	4	3	10·5	..	1	3	9·6	..	3	0	0·9
-------------------------------	---	---	------	----	---	---	-----	----	---	---	-----



TOTAL REVENUE COST (apart from interest charges and repayment of debt, and exclusive of a sum of £1,515, the expenditure during the year on the activated sludge plant) :—

							Per million gallons.		
							£	s.	d.
Sludge disposal	..	..	..	..	..	..	1	13	9.1
Filtration	..	..	..	..	..	..	2	4	2.4
General expenses	..	..	..	..	..	..	1	1	11.3
Total							£4	19	10.8

AVERAGE COST PER HEAD OF POPULATION—

d.

For year ending 30th March, 1921	..	..	..	..	=	28.8
For 16 years ending 30th March, 1921..	..	..	..	..	=	12.0

RESULTS OF TREATMENT (expressed in grains per gallon).

Four hours' oxygen absorption.			Albuminoid ammonia.		
Raw Sewage.	Average effluent, including unfiltered tank effluent	Per cent. purification	Raw Sewage.	Average effluent, including unfiltered tank effluent	Per cent. purification
6.71	3.29	51	.76	.34	55

*Filter-Pressing Experiments.*

"With regard to the treatment of the sludge by pressing, particular attention has been given to (a) type of filter cloth, (b) sundry mechanical alterations—e.g., use of perforated plates, (c) thickness of cake.

"The results so far obtained show (a) that for a sludge such as that obtained at the Withington works, a strong cotton twill cloth of fairly close texture is preferable to either open texture cotton cloth or jute cloths of any type, (b) that perforated plates of the type used were of no material advantage, (c) that when provision is made for the pressing of the sludge in thin cakes an improved product is obtainable.

"Whilst the press trials have not yet produced the results desired, sufficient progress has been made to demonstrate that a superior product can be obtained by means of filter pressing than by any machine of the centrifuge type tried at the Withington works."

*Withington Crop Trials, 1920–1921.*

"The following trials of the agricultural value of the resultant dried sludge from the Withington activated sludge plant are of interest

in confirming the belief that the nitrogen present in activated sludge is in a form readily available for plant nutrition :—

Treatment.	Barley.					Straw.	
	Plots.				Bushels per acre.	Total cwt.	Per acre cwt.
	No. 1 (in lbs)	No. 2 (in lbs)	No. 3 (in lbs)	Total lbs.			
Control unmanured ..	80	72	90½	242½	66.1	2½	34
Activated sludge, 30 lbs. N. per acre	103	95½	104	302¾	82.8	3	45
Ammonium sulphate, 30 lbs. N. per acre	100½	84	110	294½	80.3	3¼	49
Activated sludge, 60 lbs. N. per acre	106	100	108	314	85.6	3½	52
Ammonium sulphate, 60 lbs. N. per acre	102	104½	100	306½	83.5	2¾	41

Treatment.	Wheat.					Straw.	
	Plots.				Bushels per acre.	Total cwt.	Per acre cwt.
	No. 1 (in lbs)	No. 2 (in lbs)	No. 3 (in lbs)	Total lbs.			
Control unmanured ..	43	56½	78	177½	44.4	3¼	49
Activated sludge, 30 lbs. N. per acre	59¼	70	78	207¼	51.8	4	60
Ammonium sulphate, 30 lbs. N. per acre	61¼	58	77	196¼	49	4	60
Activated sludge, 60 lbs. N. per acre	62	69	71½	202½	50.6	4½	64
Ammonium sulphate, 60 lbs. N. per acre	71½	70½	53	195	48.8	4¼	64

"In conclusion it is stated that the results so far obtained from the operation of the large-scale continuous-flow activated sludge plant are such as to encourage the hope that the process may be applied successfully and economically to the purification of the city sewage in any future extension of the existing plant."

HAWORTH (John). **Dewatering Sludge at Sheffield.**—*Indian Engineering*. 1921. Oct. 8. Vol. 70. No. 15. p. 202.

"The most urgent and interesting problem at the moment is, however, that of dewatering the sludge, particularly as its nitrogen content may give it considerable manurial value. Experiments have been made in which the sludge is spread in thin layers on wire gauze and then submitted to a slight vacuum. By this method the Sheffield sludge can be reduced from 98.5 per cent. to about 75 per cent. water content almost instantly, and experimental machines for continuous operation on these lines are now being constructed."

## WATER.

SMIT (Jan). [In Dutch and English.] **Waterreiniging met behulp van kalk. Purification of Water with Lime.**—*Meded. Burgerlijk. Geneesk. Dienst in Nederl.-Indië*. 1921. Pt. 2. pp. 112-189. With 1 folding plan.

This is a second paper; the first was reviewed in the Sanitation Supplement, No. 1, March 30, 1921, p. 44. This paper deals with several aspects of the subject, such as the use of milk of lime instead of alum in a Jewell pressure filter, the use of the same to keep the permanent lime alkalinity up to about 2.5 in a swimming bath, and so to kill off the bacteria that are added by the bathers, and, finally, the use of lime in converting a dirty river water into a drinking supply.

In all these the same principle is involved, viz., that the excess of lime present kills off the bacteria very rapidly and the greater the alkalinity (with certain limits) the more rapid is the action.

We consider the author was rather ill-advised in using the pressure type of Jewell filter and not the gravity, as the former model is very much less satisfactory and is now not usually recommended by the makers. The author also finds that lime and a gravel straining filter, especially if just capped with a very thin layer of sand, give most excellent results. The original experiments testing the efficacy of excess lime on cholera and typhoid bacilli are confirmed. No organism survived longer than twenty minutes with alkalinity about 3 N/L.

*Summary of Conclusions.*

"1. The sterilising properties of lime have until now found but little application in purification of water, probably because they are considered too weak.

"2. Houston's method (long time of contact with a small excess of lime) gives not quite satisfactory results especially in the tropics. Besides it is not quite correct principally [? in principle], because the precipitated impurities are left in contact with the water too long a time, the quantity of lime being too small for total sterilisation.

"3. However, when the precipitate is separated from the water by filtration, directly after mixing with lime, nearly all germs are proved to be held back on the filter. Only a few sporiferous bacteria pass through it. This seems to be a matter of filtration rather than of sterilisation.

"4. These results are obtained when using ordinary filterpaper (even non-sterile) as well as a column of sand of the usual height. A filterpress of modern structure will probably do as well. Slow sand filtration especially lowers the coli-number, but leaves a higher bacteria-count than does rapid filtration.



" 5. The only condition for getting a satisfactory result is the addition of so much lime, that the alkalinity of the filtrate (on phenolphthaleine) is found to be 2-3 cc. normal pro L. The strongly turbid river waters of Java then give a crystal-clear filtrate, very poor in bacteria.

" 6. Sedimentation before filtration proved only valuable to spare the filters, but not essential to get a good filtrate.

" 7. On adding large amounts of pathogenic germs (typhoid and cholera) the filtrate proved to be quite free of them, using filtration both with paper or with sand.

" 8. The result with alum as a clarifier proved much less satisfactory with all methods of filtration. Using pathogenic germs it is completely untrustworthy.

" 9. Experiments with diluted lime water learned [taught] that the alkalinity cited above kills these pathogenic germs and *B. coli* in a short time, which explains the superiority of lime on alum as a clarifier.

" 10. By the combination of sedimentation during  $\pm 6$  hours with filtration by fine gravel and a thin layer of sand a filtrate was obtained, which answered all demands of a good and trustworthy swimming-water. Besides the alkalinity presented the advantage of a continuous self-sterilisation.

" 11. For the application on a large scale prescriptions were given, and the plan of a schematic project. The costs of the necessary lime amounts to something like f. 2.50 per 1,000 M<sup>3</sup>. (10 guilders per million gallons).

" 12. The construction of an automatic apparatus is being prepared."

FLU (P. C.). **Onderzoekingen over de zelfreiniging van in groote reservoirs onder toetreding van het volle zonlicht bewaard water.** [Researches on the Spontaneous Purification of Water kept in Large Reservoirs in Untempered Sunlight.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1921. Vol. 61. No. 3. pp. 294-306.

The author repeated under tropical conditions the well-known experiments of HOUSTON (Rivers as Sources of Water Supply, 1917) on the spontaneous improvement of physical, chemical and bacteriological properties of Thames water kept in open reservoirs.

He used water from the River Tjiliwoeng (Batavia) stored either in basins of 35 litres or in a cemented reservoir of 80 cub. meter. The tests were made during eight consecutive days.

Tjiliwoeng water kept for a week shows an important decrease in its number of bacteria, sometimes to under 100 per cc.

Pathogenic germs (cholera, dysentery, typhoid) disappear in the reservoirs within a week, the first two quicker than the last.

The coli (fermentation) test shows a decrease of its titre also, but remains comparatively high. If the Eijkman test is negative in 10 cc. of river water stored in a large reservoir, the author thinks this water may be safely considered to have undergone such a degree of self-purification that it no longer contains pathogenic organisms.

The physical properties of the water improve little by storage.

The author comes to the following conclusion:—

In a tropical lowland climate surface water can be rendered practically harmless by storing it in large open reservoirs for eight days.

This method may be strongly recommended in cases where the source of a water supply is exposed to gross pollution and a strict bacteriological control of the filtered water is impossible. [In addition, control generally comes late.—Ref.]\* [These results exactly confirm the work done in India at the King Institute, Madras, and by CLEMESHA in Bengal.—W.W.C.]

EGGERT (E. G.). **Chlorination of Water by the Use of Liquid Chlorine or Hypo.**—*Texas State Jl. Med.* 1921. Oct. Vol. 17. No. 6. pp. 311-312.

The writer deals briefly with the subject of chlorinating water by his well-known methods, viz., liquid chlorine and the chloride of lime. He points out the difficulties of each; there is very little new. He gives the following test for pure chlorine.

“Ortho-toluidine test for excess chlorine is made by dissolving one gram of the toluidine, which must be the pure chemical, in one litre of 10 per cent. hydrochloric acid. Put about 20 drops of this solution into a water glass and then fill the glass with the water to be tested. If the water changes to a faint yellow colour, the proper amount of chlorine has been added. If the colour is orange yellow, an excess is indicated. This test must, of course, be applied shortly after the addition of the chlorine.”

BUNKER (Geo. C.). **Discussion of R. S. Weston's Paper: "Lead Poisoning by Water."**—Reprinted from *Jl. New England Water Works Assoc.* 1920. Dec. Vol. 35. No. 2. pp. 126-136. With 2 text figs.

This is a useful paper dealing with the chemical contents of waters that are actively plumbo-solvent.

The author had to deal with a water at Gatun, Canal Zone, that was of very low alkalinity and highly plumbo-solvent. He desired to know what was the least amount of lime it is necessary to add to ensure a plumbo-solvency as low as 0.1 parts per million. To answer this question he had a new 1 in. lead pipe jointed into the main and ran water through it, taking two sets of samples for analysis: (1) samples that just flowed through the pipe, and (2) samples that remained in overnight. A large number of samples were carefully analysed. As a result of this work he considers that a carbonate alkalinity ( $\text{CO}_3$ ) of 2.4 parts per million produced by the addition of lime must be maintained to keep the lead content in filtered water as low as 0.1 part per million, but this does not apply to new lead pipes, as even with this alkalinity as much as 0.5 parts per million are recorded. The author refers to some work of Mr. WESTON and publishes an interesting table of results, given on opposite page.

He also points out that in a chlorinated water containing a little free chlorine the presence of this gas does not increase the plumbo-solvency of the water. This point was also investigated by the Hygiene Laboratory in Egypt and the same conclusions were reached.

---

\* Summarized by Dr. W. J. BAIS.

TABLE VI.—ACTIONS OF VARIOUS WATERS ON LEAD.  
(Houston's Method.)

Source of Sample.	Parts per Million.					Hydrogen-Concentration.	Conductivity.	Remarks.	
	Reaction to Lactmold.	Alkalinity to Brythrosine.	Soap Hardness.	CO <sub>2</sub> .	Lead Found in Water.				
					One Day.				Seven Days.
Agua Clara Purification Plant :									
(1) Settled water, not treated with lime	Acid	4.0	25.3	6.8	5.0	9.5	70.6	No erosion	
(2) Filtered and disinfected water, 1.2 p.p.m. CO <sub>2</sub> alkalinity	Alkaline	16.3	42.6	—	2.0	2.5	93.6	No erosion	
(3) Same as (2) with addition of lime to obtain 2.4 p.p.m. of CO <sub>2</sub> alkalinity	Alkaline	17.3	45.3	—	1.0	1.7	106.0	No erosion	
(4) Same as (2) with addition of lime to obtain 4.8 p.p.m. of CO <sub>2</sub> alkalinity	Alkaline	19.3	47.9	—	2.0	1.5	111.5	No erosion	
(5) Same as (2) with addition of soda ash to obtain 2.4 p.p.m. of CO <sub>2</sub> alkalinity	Alkaline	20.4	43.9	—	1.2	2.0	98.1	No erosion	
(6) Same as (2) with addition of soda ash to obtain 4.8 p.p.m. of CO <sub>2</sub> alkalinity	Alkaline	23.1	45.3	—	1.8	1.5	107.0	No erosion	
(7) Filtered and disinfected water from Mt. Hope Purification Plant	Alkaline	40.8	43.9	2.6	1.5	1.2	98.1	No erosion	
Miraflores Purification Plant :									
(8) Filtered water	Alkaline	52.0	53.2	3.8	1.5	2.5	117.0	No erosion	
(9) Filtered water after disinfection	Alkaline	52.0	53.2	4.2	1.5	2.0	121.3	No erosion	
(10) Filtered and disinfected water from wash-water tank	Alkaline	52.0	53.2	3.8	1.5	2.0	121.3	No erosion	
(11) Water supply of Cartago, Costa Rica	Alkaline	65.3	61.4	19.0	1.8	3.2	146.1	No erosion	
(12) Water from Thermal Spring, Cartago, Costa Rica	Alkaline	885.0	468.5	132.0	1.2	1.5	2948.7	No erosion	
(13) Water supply of San José, Costa Rica	Alkaline	57.1	54.6	5.8	1.8	1.5	107.4	No erosion	
(14) Water supply of Port Limón, Costa Rica	Alkaline	88.8	86.6	0.8	1.5	1.0	171.8	No erosion	
(15) Santa Ana mineral water, Costa Rica	Alkaline	829.8	516.0	720.0	1.0	2.1	2465.0	No erosion	
(16) Mineral water from Miraflores dump, Canal Zone	Alkaline	523.6	1060.0	4.4	2.0	2.5	4292.5	No erosion	
(17) Distilled water	Neutral	1.5	4.0	—	185.0	500.0	1.7	Erosion	

Notes: Residual Cl: Sample 2—0.01 p.p.m.; Sample 7—0.01 p.p.m.; Sample 9—0.24 p.p.m.; which disappeared in one hour thirty-five minutes; Sample 10—0.01 p.p.m.

Dissolved Oxygen: Sample 9—7.3 p.p.m.; 92.2 per cent. sat. Sample 10—7.4 p.p.m.; 93.4 per cent. sat. All erosions noted after samples stood seven days.

Average temperature of closet in which test tubes were stored was 26.3 degrees Cent.

Phenol red used as indicator for Ph determinations above 6.6; methyl red for those below 6.0.

The pieces of lead used in these experiments measured  $1 \frac{1}{2} \times \frac{1}{2} \times \frac{1}{16}$  in.



MENDELSON (Ralph W.). **Some Public Health Problems of the Far East.**—*Jl. Amer. Med. Assoc.* 1921. Oct. 22. Vol. 77. No. 17. pp. 1361-1364. With 12 text figs.

This is a beautifully illustrated account of the experiences of an officer who has just completed six years' service as a sanitarian in Siam. Practically everybody who has done work in the tropics has passed through the same stages. The following figures are of interest :

CHOLERA—CITY OF BANGKOK.—EFFECT OF A PURE WATER SUPPLY.

---

<i>East Side of River, Pure Water.</i>								Absolute	
		Morbidity		Case		Mortality		per	
Population.	Cases.	Thousand.	Deaths.	per cent.	per cent.	Thousand.	per cent.	Thousand.	per cent.
603,126 ..	829 ..	1.376 ..	483 ..	58.26 ..	0.800 ..				
<i>West Side.</i>									
72,610 ..	684 ..	9.42 ..	360 ..	52.63 ..	4.958 ..				
<i>Total.</i>									
675,736 ..	1,513 ..	2.239 ..	843 ..	55.71 ..	1.247 ..				

---

The east side of the river has a protected supply, the west has not.

## SMALLPOX VACCINATION.

BLAXALL (F. R.). **Some Notes in Connexion with the Preparation of Vaccine Lymph at the Government Lymph Establishment.**—*Proc. Roy. Soc. Med.* (Sect. Epidemiol. & State Med.). 1921. Nov. Vol. 15. No. 1. pp. 1–13.

As the work of preparing vaccine lymph now carried out in most tropical countries has been modelled on that in Dr. Blaxall's laboratory—varied, if necessary, to suit local conditions—it is not to be expected that this recent paper would contain much that could be called new. There are, however, several points that may be less well known than they should be, and, at any rate, will bear repetition. Concerning the inoculation of rabbits, the writer says: "The initial error had been due to want of appreciation of the peculiarities of the rabbit's skin, which is extremely thin and is stated to have no rete Malpighii. If incised with a sharp instrument the skin immediately gapes and the lymph fails to take or takes only in a poor and crusty fashion. But if the skin be very gently abraded and lymph rubbed in, the result is a confluent eruption in which individual vesicles can hardly be distinguished. Indeed Pfeiffer at one time thought that the rabbit did not produce vesicles, but in this I convinced him he was mistaken. The eruption should be removed from the rabbit at forty-eight hours or not later than seventy-two hours. A rabbit yields about  $\frac{1}{4}$  gm. lymph pulp. The rabbits should be vaccinated with the best lymph obtainable, not with one which has shown previously signs of deterioration."

Dr. Blaxall gives a useful description of the variety of appearances met with in a vaccinated calf.

"From a total failure to such a perfect lymph one can roughly graduate the results of development into several classes:—

"(1) The total failure. Not a sign of vesiculation or irritation is to be seen. The incisions made when vaccinating have healed, and though only five days have elapsed hardly any trace of them can be seen. Such results fortunately are uncommon; probably the average is well below 1 per cent., but they are liable to occur in batches, and I have known as many as twenty-six in a sequence of 750 calves.

"(2) The incisions have not quite healed, and show a slight redness along the lines. Here obviously there has been irritation, which has subsided.

"(3) Raised red lines. Here there has been some attempt at papulation, the irritation has been considerable, but the whole process has aborted. This is one of the commonest kinds of failure.

"(4) A group of appearances showing a somewhat similar condition, but with here and there a vesicle, either fully developed or slight, irregular in appearance or aborting.

"(5) The group where vesiculation has taken place partially or slightly, perhaps with separate vesicles like beads on a string, or, where continuous, forming a narrow band not exceeding perhaps  $\frac{1}{16}$  in. in diameter. Such slight development might be due to retardation, but if collection is delayed for a day or two development proceeds no further, and the vesicular lines abort or slowly dry up.

"(6) Comprises the large group of average or ordinary lymphs. Here vesiculation has taken place more or less continuously over the whole area, but with some irregularities. The vesicles vary here and

there in size and in appearance, some of them may be misshapen and with spreading or indented margins. The ends of the incisions often taper to a point instead of being evenly rounded off; there may be gaps in the lines of vesiculation and the areola may be marked.

"(7) This is a group in which vesiculation is continuous and more regular, and leads eventually to the perfect lymph.

"(8) There is still another group called 'advanced' lymph—not a good term, for it suggests that the vesicles have developed before their time. But this is not always the case, the condition being due more to an over-luxuriance of growth, the vesicles developing with an uncontrolled exuberance. The specific organism has over-reached itself and broken down the usual barriers of resistance, or, from the other point of view, the leucocytic infiltration has been so fierce that it has unduly swollen and distorted the vesicles. The vesicular bands are swollen and broadened from  $\frac{1}{2}$  to  $\frac{3}{4}$  in. in diameter, generally very irregular in outline, umbilication marked, and the centre of the vesicles darkened as with haemorrhage. To the touch the vesicular band feels soft and pulpy. The yield will be heavy in weight, and herein lies the trouble, for frequently the weight is greater in proportion to the potency, and though when used for vaccinating purposes the case success may be quite good, the insertion success may be below the standard, since the specific organisms are not sufficiently numerous to correspond to the increase of weight and subsequent dilution. Warm weather undoubtedly helps to promote this development, but it is not the sole cause, as advanced lymphs occur in cold weather. Again it must be attributed to the 'condition' of the calf.

"All these groups, from and including group (5), give satisfactory results as regards vaccination, though group (5) itself and the advanced lymphs are on the borderline of doubt."

On the subject of weight of lymph collected the writer says 9–10 gm. is the average—lymphs weighing more than 16 gm. per calf are of doubtful potency. No first-class quality lymph has ever weighed more than 12 gm. within his experience. It is quality not quantity that is required.

The best diluent is: Glycerine 50 per cent, water 50 per cent. by weight, oil of cloves 0.1 per cent.

"The lymph organism is adversely affected by conditions of acidity, therefore the mixture of glycerine and water after sterilisation is carefully titrated and brought over to alkalinity by means of sodium carbonate or other alkali, and this alkalisation is repeated if acidity reappears."

The mixture is kept for one week at 60° F. to hasten elimination of extraneous bacteria and then at 10° F. in the cold store.

REECE (Richard J.). **An Account of the Circumstances associated with an Outbreak of Disease among Milch Cows, Horses, and their Attendants, believed to be of the Nature of "Cow-Pox," in the County of Somersetshire in the Year 1909, and Considerations arising therefrom.**—*Proc. Roy. Soc. Med.* (Sect. Epidemiol. & State Med.). 1921. Nov. Vol. 15. No. 1. pp. 13–26. With 5 figs.

The writer gives a very interesting and full account of the history of cowpox from the time of JENNER, BRYCE and CEELY (1839–42), and goes on to describe the outbreak in Somersetshire.



## DISINFECTION.

SÉGUY (F.). **Note sur une dératisation et désinsection de navire par la chloropicrine.**—*Arch. Méd. et Pharm. Nav.* 1921. Nov.-Dec. Vol. 111. No. 6. pp. 509-511.

The writer used chloropicrine to fumigate a ship whose hold capacity was calculated at 4,000 cu. m.; 5 cc. per cu. m. was allowed, so 20 litres was used for the whole operation. Cost: 14 francs per litre. The operation was carried out by one person, who was of course provided with a gas mask.

It could have been rendered simpler had a graduated syringe been available to inject the calculated quantity of the compound into each hold in a fine jet. Twenty-four hours aeration was allowed. This was sufficient to allow people to enter the ship but not enough to make the cabins habitable. One officer who attempted to sleep in a cabin was forced to vacate. All rats and bugs were killed. The method is simple, easily carried out, efficient and cheap.

VAN SLOOTEN (J.). **Mededeeling omtrent eenige proeven tot het ontratten van goederenloodsen door middel van zwaveldioxyde in zwakke concentratie.** [On Some Experiments to exterminate Rats from Godowns by means of Sulphurous Acid in Low Concentration.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1921. Vol. 61. No. 3. pp. 340-345.

Sulphurous acid has a very irritant action on rats in concentrations far below the deadly dose. The animals will either attempt to clear out or press their noses into rice bags and similar objects, using these as "gas masks." Experiments made by the author of burning sulphur in open godowns, from which the rats could only escape into traps, gave unsatisfactory results. Of respectively 51, 103 and 105 stained rats set free in the godowns before the experiments only 2, 6 and 5 flew into the traps. On the next four days respectively 32, 6 and 19 of them were found dead between the goods. After that time the stain was not recognizable in any rat corpses found. The concentration of the sulphurous acid in different parts of the godowns varied during the experiment from 0.0054-0.021 volume per cent. In their attempts to escape from the vapour the rats apparently hide between the goods stocked in places where the gas concentration for some time remains very low.\*

WERNICKE (Raul). **Ensayos con la cámara desinsectante de Hartmann (aire caliente circulante).**—*Rev. Inst. Bacteriolog.* 1921. Mar. Vol. 2. No. 6. pp. 41-48. With 6 text figs.

CARBONELL (Manuel V.). **Experiencias de desinfección por medio del aire caliente agitado.**—*Ibid.* pp. 49-54.

These two papers may be considered together, as one gives a description of two pieces of apparatus and the second gives the results of testing the same, making use of plague bacilli and staphylococcus. These disinfectors are: (1) Vondran's chamber (BAERTHLEIN, *Cent. f. Bakt.* 1916. Vol. 78. No. 7. p. 527) and Hartmann's chamber (WEISS (E.) *Arch. f. Hyg.* 1918. Vol. 88). Sketches of these are given; they do not require any description, as the method of working is evident.

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\* Summarized by Dr. W. J. BAIS.

WERNICKE]

## VONDRAN'S DISINFESTING CHAMBER.

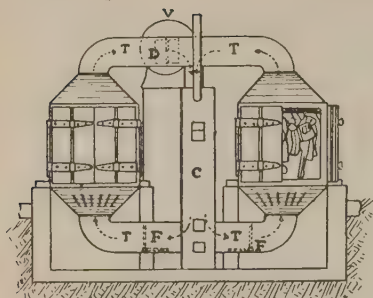


FIG. 8.—Front view.

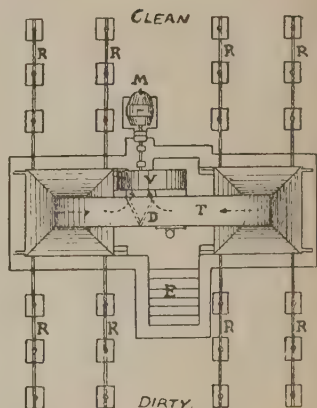


FIG. 9.—View from above.

- C Heating apparatus.
- D Mechanism for regulating fresh air supply to chambers.
- E Steps.
- F Apparatus for cutting off hot-air current.
- M Motor for air-fan.
- R Frames for suspension of clothes.
- T Hot-air tubes.
- V Air-fan.

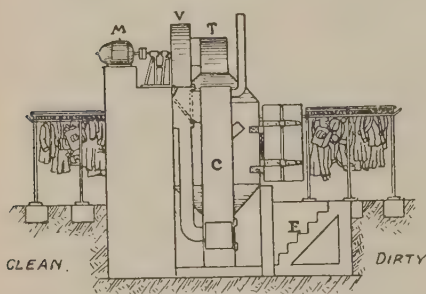


FIG. 10.—Section through centre.

## HARTMANN'S DISINFESTING CHAMBER.

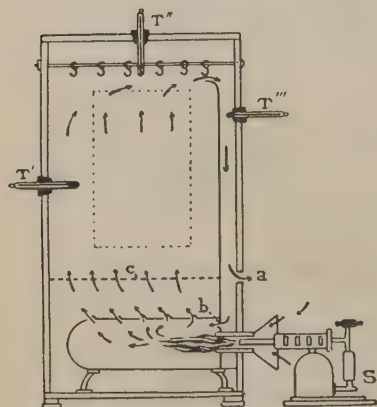


FIG. 11.—Vertical section parallel to front of chamber.

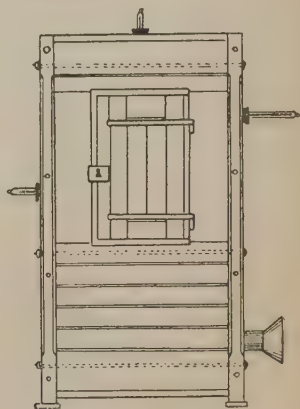


FIG. 12.—Front view of chamber.

- a Vent for escape of gases of combustion—closed with a plug when chamber is in use.
- b Vents to admit of re-circulation of gases.
- c Wire netting to prevent contact of suspended clothes with flame from blow lamp.
- S Blow lamp apparatus.
- T Thermometers.

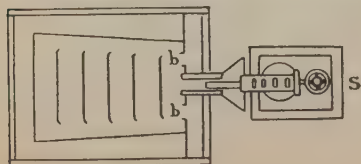


FIG. 13.—Horizontal section parallel to base.

[Reproduced from *Revista del Instituto Bacteriologico.*]

The main point about these pieces of apparatus is that the hot dry air circulates through the clothes, in the former by a power-driven fan and in the latter by means of a blow lamp and ventilators. The results show that bacteria, flies and lice are quickly destroyed, plague bacilli only requiring five minutes at 100° C. when the air was in motion; when it was stationary 30 minutes was necessary.

BRUG (S. L.) & KORTHOFF (G.). **Verslag van een onderzoek naar de desinfecteerende werking van Izal.** [Report on Experiments concerning the Disinfectant Power of Izal.].—*Geenesk. Tijdschr. v. Nederl.-Indië*. 1921. Vol. 61. No. 5. pp. 551-564.

Izal (Newton, Chambers & Co., Ltd.) was found to act as a powerful disinfectant on pathogenic microbes (typhoid fever, dysentery, colibacillus, cholera vibrio, staphylococcus) and protozoa (cysts of *Entamoeba histolytica* and *Lambliia intestinalis*). Its action as a larvicide (*Culex* larvae) was inferior to that of crude creoline, and in killing the eggs of *Ascaris*, sapocarbol (liquor kresoli saponatus) proved to be better than Izal. For practical purposes a 1 per cent. solution of Izal is recommended.\*

NEVEUX. **Emploi d'une armoire [Wardrobe] comme chambre de sulfuration pour la destruction des ecto-parasites.**—*Rev. Méd. et Hyg. Trop.* 1921. Vol. 13. No. 2. pp. 55-59. With 1 text fig.

This paper deals with some simple and obvious applications of well-known principles of fumigating garments infested with bugs and fleas and of dealing with bugs in houses.

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\* Summarized by Dr. W. J. BAIS.

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## REPORTS AND VITAL STATISTICS.

- i. MAURITIUS. Report on Communicable Diseases in Port Louis.—20 pp.
- ii. —. Report on the Sanitation of Beau Bassin, Rose Hill, Quatre Bornes, Phoenix, Vacoas and Curepipe.—38 pp. With 1 plan.
- iii. —. Report on Sanitary Matters in the Districts of Grand Port and Savanne.—12 pp.
- iv. —. Report on Sanitary Matters in the Districts of Rivière du Rempart and Flacq.—11 pp. With 1 plan.
- v. —. Report on Sanitary Matters in Black River District and the Extra Urban Area of Plaines Wilhems.—10 pp.
- vi. —. Report on Sanitary Matters in the Districts of Moka and Pamplemousses.—13 pp.
- vii. —. Report on Medical Matters in Mauritius.—20 pp.  
[By BALFOUR (Andrew), C.B., C.M.G., M.D., Director-in-Chief of the Wellcome Bureau of Scientific Research, London.] 1921.  
Printed by authority of His Excellency the Governor. Mauritius: P. G. Bumstead, Acting Government Printer.

i. This is a second part of Dr. Balfour's report on Mauritius and deals exclusively with the disease prevalence in Port Louis. [See Sanitation Supplement, No. 3, 1921, p. 216.]

*Ankylostomiasis*.—In a recent report by KENDRICK the infection-rate was 29·4 per cent. for Port Louis district, which is largely urban area. The population do not appear to present many symptoms of the disease, but in the more rural areas it is probably more prevalent.

It is interesting to note that *Chenopodium ambrosioides* var. *anthelminticum* is indigenous in Mauritius and that with better methods of cultivation and selection of seeds a useful industry might be started, as the world's supply of this oil is not very great. The writer also suggests the use of *Flammenwerfer* to sterilize the soil of badly contaminated localities.

*Beriberi* is present in the island. It is suggested that highly milled Siam rice be excluded by law from the colony and the Burmah rice be substituted.

*Dysentery and Diarrhoea*.—Both bacillary and amoebic exist, in all probability "ciliate" dysentery as well. The recommendations deal with flies, carriers, markets, restaurants, etc. The author considers it is highly necessary that any condition where mucus and blood are present in the stool should be made a notifiable disease.

*Enteric group*.—This subject was largely dealt with in the last report under the head of water and conservancy. The atropine test described in Manson's "Tropical Diseases," edited by MANSON-BAHR, is recommended as a diagnostic test.

*Influenza*.—Mauritius suffered severely with the rest of the world in 1919. There were 1,335, 1,218 and 2,281 cases treated at the Civil Hospital, Central Dispensary and Eastern Dispensary respectively.

"Attention may be directed to a new prophylactic measure which, in the hands of Dr. J. A. Taylor, the Senior Medical Officer of the Uganda Protectorate, has yielded very good results.

"It consists in adding together equal parts of ordinary tincture of iodine (B.P.) and native honey. Two or three drops of this mixture are placed on the tongue of contacts at least every three hours throughout the day.

"Dr. Taylor vouches for the efficacy of the application and the method is so cheap and simple that it would certainly seem to merit



a trial in Mauritius. The great thing is to use the remedy regularly and with sufficient frequency."

*Malaria*.—A method of attacking the *Anopheles* larvae by propagation of that of *Culex tigripes* is suggested for further investigation. It is found that the culicine is a voracious feeder and devours the larva of *Anopheles costalis*, the malaria carrier; but should "millions" coexist, the *tigripes* larvae are devoured by the fish and the anopheline larvae escape by hiding in the algae.

*Plague* recommendations follow the usual lines, but a strong case is made for a rat-proof Government grain store to be built in the Customs House Yard, all grain being stored there for a period and the premises deratized frequently.

*Tuberculosis* is fairly common :—

"It is necessary to get rid of the slums, to place restrictions upon drink, to improve the food and clothing of the lower classes, to fight destitution, to disseminate information and to treat early cases. Such a programme is by no means easy to carry into effect. It is hoped that a serious effort will be made to improve housing conditions and to deal with the drink traffic, but poverty and poor food are dependent on social conditions which are often difficult to remedy. Something has been done in the way of directing attention to the danger of promiscuous expectoration, but it is necessary to educate the individual sufferer, and I do not know how this is to be accomplished without the aid of a Tuberculosis Dispensary which will, at the same time, extend help to the early case."

"In connection with the general tuberculosis campaign in Mauritius I think that help might possibly be obtained from that remarkable organization, the International Health Board, which has already done so much for humanity. This Board, not long ago established a Commission for the Prevention of Tuberculosis in France and the work is carried out under four main Departments :—

"(a) Medical, which operates model dispensaries for the demonstration of working methods.

"(b) A Department of Extension which organizes and equips dispensaries in various parts of the country.

"(c) Nursing, which maintains training schools for public health visitors and supervises their work.

"(d) Education, which organizes exhibitions, holds meetings and distributes literature. It makes use of the cinematograph as an agent in its propaganda."

Worm infection would appear to be very common from the few figures that are available. An active hookworm campaign would remove this evil as well as rid the populace of hookworm.

ii-vii. Since the above review was written, six other parts of this valuable report have been received. All but one of these deal with a portion or province of the island. They are of very great interest and all end in a long list of recommendations suited to the conditions described, but as these do not differ much from those in any other part of the tropics it is not necessary to repeat them.

Probably one of the most valuable and instructive parts of these reports is the remarks on the various sugar plantations. It would appear that a fair number of these are by no means in a satisfactory condition.

"Melrose.—This is a bad place with marshes and ponds in the neighbourhood. There is much malaria. The water supply comes from the Boucan River. The hospital possesses a good type of bed but is a wretched place, the building being ruinous, the bedding bad and the latrines abominable. It is time the Protector of Immigrants looked into the matter."

The accompanying plan of a smoke pit latrine which has been found to give good results on estates is of general interest; the diagram does not need description. The latrine is easy to construct and quite as satisfactory as the Stokes latrine described on p. 38 of Sanitation Supplement, No. 1, 1921, March 30.

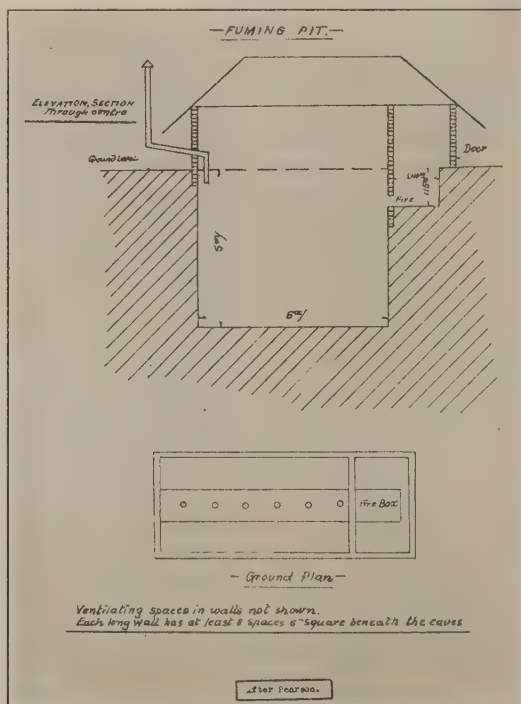


FIG. 14.—Plan of Fuming-pit as now employed in parts of the Belgian Congo. These pits have been recommended for use on the sugar estates in Mauritius.

[Reproduced from the *Transactions of the Royal Society of Tropical Medicine & Hygiene*.]

There are some interesting observations about the habits of *Anopheles costalis* (Report iv):—

"A question of great interest and importance, to which attention must be directed, is the disappearance of *Anopheles costalis* throughout many localities during the winter months. It is conceivable that the adult female mosquitoes in certain localities hibernate during the colder season of the year. Persistent efforts should, therefore, be made to find hibernating mosquitoes. I have searched underground premises at the Observatory, Pamplémousses, and have examined a few cow-sheds but, so far, without effect.

"Dr. Castel has agreed to instruct two of his best 'moustiquiers' to carry out a careful search. If this problem could be solved it might be possible to destroy the hibernating females with most advantageous results.

"Unfortunately it is difficult to find any place where *A. costalis* congregates. It is in no sense of the word a domestic mosquito and hence it may not hibernate in any places near human habitations. It appears that, unlike *A. maculipennis*, the common malaria vector of Europe, it does not seek the shelter of stables and cow-sheds during the winter. It is possible that it conceals itself in the vicinity of marshes or finds a refuge in woods or undergrowth.

"It is also true that it may not hibernate at all but, if so, it is not easy to account for its sudden disappearance and its equally sudden appearance in many places where fever is only rife during the summer. There are, of course, places where it breeds all the year round and perhaps it spreads quickly from these once the warm weather begins. Whatever may be the case I cannot help thinking that this is one of the crucial questions to be elucidated in Mauritius, and if there is difficulty in solving it, I believe it would pay to enlist the services of an expert entomologist. If there is no hibernation it is clear that the best time to destroy the broods is during the cold season when the nurseries are few and scattered. At that period there should be intensive work, the mosquito brigades being withdrawn in great part from localities in which there is little or nothing for them to do and concentrated in the places where *A. costalis* is breeding."

ROCKEFELLER FOUNDATION. **International Health Board. Seventh Annual Report, January 1, 1920.-December 31, 1920.** 150 pp. With 80 text figs. 1921. January. New York: 61 Broadway.

This is one of the most interesting annual reports that we have seen. It deals with the activities in many parts of the world of the International Health Board. Some idea of the extent of the work can be gathered from the following list of subjects dealt with in this volume:—Tuberculosis work in France; yellow fever in Guatemala, Honduras, Nicaragua, Salvador, Guayaquil, Ecuador, West Africa; malaria control in many states of U.S.A.; hookworm work in the Southern States, and in the West Indies, Brazil, Central America; and many others too numerous to mention. Unfortunately, we cannot hope to deal fully with all these various spheres but there follow a few extracts about the more important.

Yellow Fever.—"In Brazil.—The infected area in Brazil is being steadily reduced. Extending in former years from Rio de Janeiro along the east coast to the mouth of the Amazon river and up the Amazon valley to Iquitos in Peru, the disease is now confined to a narrow coastal strip from Pernambuco to Bahia. These two ports are suspected as endemic foci, from which the infection spreads from time to time to the surrounding regions."

. . . . .

"In Peru.—Early in the year 1919 an extensive epidemic of yellow fever broke out in the department of Piura, just across the Ecuadorian border in northern Peru, and in twelve months had spread unchecked over a considerable area. The epidemic numbered more than 3,000 cases, with from 500 to 600 deaths. Mosquito control undertaken

by Government in 1920, and carried out under the direction of Dr. Henry R. Carter, of the United States Public Health Service, resulted in the epidemic being promptly suppressed."

"Yellow Fever Vaccine and Serum.—Killed cultures of *Leptospira icteroides* were first prepared and used by Noguchi for protective inoculation against yellow fever in Guayaquil in 1918 with suggestive results. The vaccine has been used on a considerable scale in Mexico

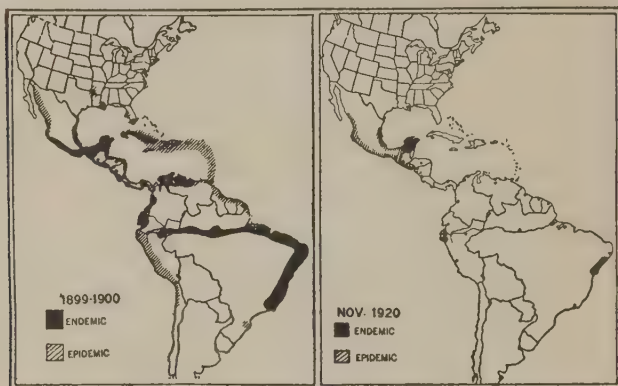


FIG. 15.—Result of twenty years' war on yellow fever. Few endemic or epidemic centres remain in the western hemisphere.

and Central America with results which seem to support the earlier indications. A therapeutic serum prepared by Noguchi is also available for the treatment of yellow fever. The use of this serum given in the early days of the disease in a limited number of cases seemed to reduce the usual yellow fever mortality of 50 to 60 per cent. to 9 per cent. These products are being supplied to government authorities in Mexico, the Central American countries, Peru, and Brazil. It is to be borne in mind, nevertheless, that the vaccine, however valuable as a protection to the individual, is *not* a substitute for thoroughgoing mosquito control."

. . . . .

#### *Malaria Control in a Rural Community.*

"Oil and the top minnow were the principal weapons employed [Mississippi]. The results were a further demonstration of the efficiency of the top minnow and a reduction of 77 per cent. in malaria incidence at a per capita cost of \$2.60 for 1919 and of \$3.09 for 1920."

. . . . .

#### *Hookworm.*

"Correlation between Number of Hookworms and Hemoglobin Index.—The Hemoglobin index is a very good means for determining, in the case of individuals as well as of groups, the degree of injury that hookworms are producing. Fig. 17 illustrates the relationship between the hemoglobin index and the number of hookworms as ascertained by Drs. Smillie and Darling in their work in rural Brazil.



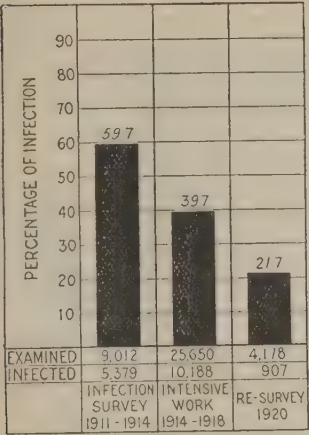


FIG. 16.—Decline in hookworm incidence among school children in Southern States during the ten-year period, 1911-1920. Based on examination of 38,840 cases in twelve counties.

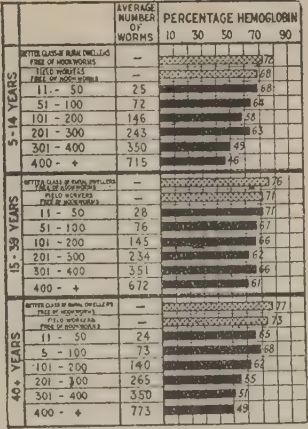


FIG. 17.—Children and old people in rural Brazil suffer more severely than young adults from the effect of hookworm disease. Haemoglobin index in relation to number of hookworms harbored. Distribution by age groups.

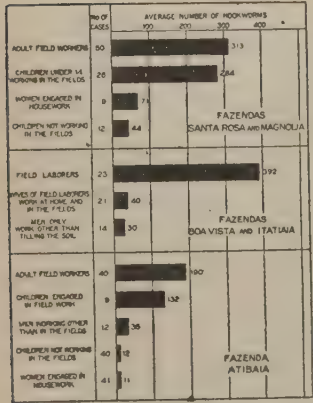


FIG. 18.—Relative intensity of hookworm infection among agricultural labourers and persons engaged in other occupations. 299 cases. Brazil.

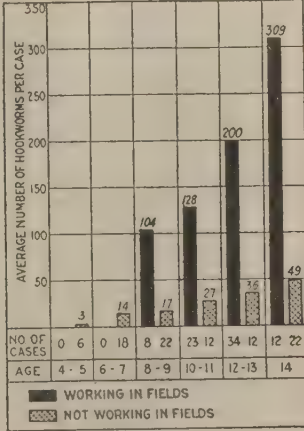


FIG. 19.—Relative intensity of hookworm infection among children working in fields and those not working in the fields. Classification by two-year age groups. Brazil.

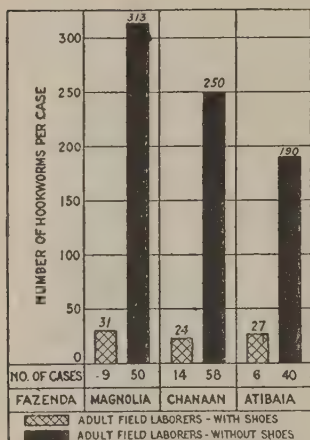


FIG. 20.—Effect of shoes in controlling hookworm infection. Worms harbored by field workers wearing shoes compared with number harbored by those not wearing them. Three coffee plantations in Brazil.

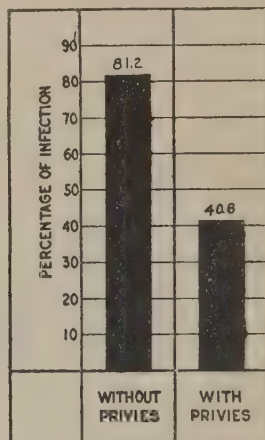


FIG. 21.—Rôle of latrines in controlling hookworm disease. Comparative incidence (based on examination of 8,465 cases) of the disease among users and non-users of latrines. Colombia.

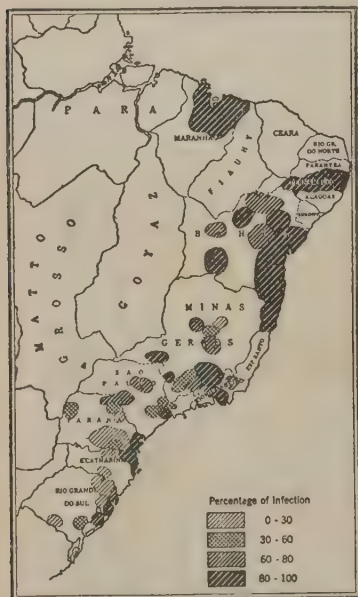


FIG. 22.—Distribution of hookworm infection in Brazil, as indicated by infection surveys. Note extreme high incidence along the coast.

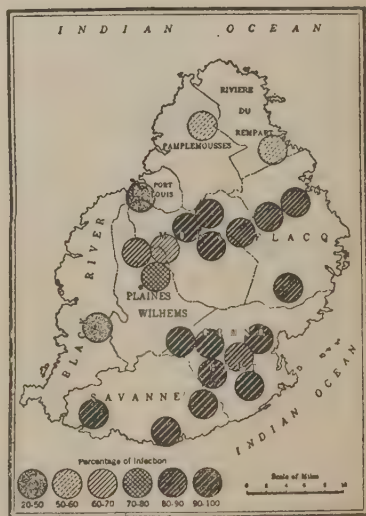


FIG. 23.—Hookworm infection survey map of Mauritius.



FIG. 24.—Excellent sanitary conditions have prevented hook-worm disease from gaining a foothold in the mines of Australia. View of interior of change-house, South Mine, Broken Hill, New South Wales.



FIG. 25.—Surface latrine, showing pails for use underground. Zinc Corporation Mine. Australia. Latrines are used by all employés, underground and surface.



FIG. 26.—Insanitary condition of alleys and yards in suburbs of Port Arthur, Texas, before Jefferson County health department began work (*see* Fig. 27).



FIG. 27.—Sanitary latrines just completed under supervision of Jefferson County health department. Suburbs of Port Arthur, Texas (*see* Fig. 26).

(Figs. 15 to 27 are reproduced from the Seventh Annual Report of the International Health Board, Rockefeller Foundation.)



Seventy-five worms are seen to produce in all groups a definite lowering of the hemoglobin amounting to about four points. As the worms increase in number beyond this figure the hemoglobin of children and of persons more than forty years of age declines rapidly and continuously until the index of cases with upward of 400 hookworms is more than twenty points below normal."

"Direct Contact with Humid Earth Chief Factor in Infection.—The studies bearing on the relationship between contact with humid earth and the incidence of infection with hookworm disease demonstrated that under Brazilian conditions hookworm is an occupational disease—a disease of those who work in the soil. The number of worms harbored was found to vary directly with the amount of time the individual spent in bare feet in the fields."

"Slow Acquisition of Hookworm Infection.—Theoretically it is possible to acquire massive infection with hookworms following a single exposure; the field studies in Brazil showed that actually this does not occur. They indicated, on the contrary, that the infection is gradually acquired, a worm here and another there, and that many days and weeks pass without any addition to the number harbored."

BRITISH GUIANA. **Government Public Health Department, Georgetown. Annual Reports of the Health Officer for the Years 1919 and 1920.** [MINETT (E. P.), Government Medical Officer of Health.]—7 pp.; 10 pp.

#### *Health Statistics.*

Summary of statistics for the years 1919 and 1920 as compared with 1918 are as follows for the whole Colony:—

	1918.	1919.	1920.
Population .. .. .	310,972	305,991	307,290
Births registered .. ..	7,791	7,938	9,788
Birth-rate per 1,000 persons	25.1	26.0	31.9
Deaths registered .. ..	12,614	12,377	7,879
Death-rate .. .. .	40.6	40.4	25.6
Infantile mortality rate per 1,000 registered births..	223	185	148

#### *Principal Diseases of the Colony—Death-rate per 1,000 Persons.*

	1918.	1919.	1920.
Malaria .. .. .	5.4	4.1	3.3
Enteric fever .. .. .	0.4	0.4	0.4
Tuberculosis .. .. .	1.7	1.4	1.3
Filariasis .. .. .	0.3	0.3	0.3
Influenza .. .. .	5.4	11.0	0.5
Bowel complaints (including Diarrhoea, Dysentery, &c.) .. ..	—	—	3.3
Pneumonia and Bronchitis .. ..	—	—	3.0
Kidney diseases .. .. .	—	—	2.7
Diseases of early infancy (including Premature Birth, Icterus, &c.) ..	—	—	2.1

"As will be seen from the above figures, the epidemic of influenza which raged in the colony during the latter part of 1918 with the early part of 1919 was responsible for over one-quarter of the total deaths

in the colony during the latter part of the epidemic. Of the total deaths recorded in 1918, practically one-third occurred in the December quarter, and of those registered in 1919, nearly half the total for the whole year occurred in the March quarter."

"The staff of the Government Public Health Department is graded as follows :—

Grade.	Necessary Qualifications.
Class I.—County Sanitary Inspector	(a) Inspector of Nuisances (R.S.I.). (b) Inspector of Meat and other Foods (R.S.I.).
Class II.—Sanitary Inspector	Inspector of Nuisances (R.S.I.).
Class III.—Assistant Sanitary Inspector.	The Local Certificate in Elementary Sanitation.

"Infant Welfare and Tuberculosis Health Visitors are required to hold the following certificates :—

Lady Superintendent	..	(a) Central Midwives Board Certificate (C.M.B.).
		(b) Certificate for Women Health Visitors and School Nurses (R.S.I.).
Health Visitors	.. ..	Certificate for Women Health Visitors and School Nurses (R.S.I.).
		or
		The Local Certificate for Women Health Visitors.
Midwives	.. ..	The certificate granted by the Government.

### *Malaria.*

"The death rate of this disease shows a falling-off from 4.1 per 1,000 persons living in 1919 to 3.3 per 1,000 persons living in 1920. Doubtless the abnormally dry season in some part accounted for this, but there is no doubt that the general improvement in sanitary and economic conditions also largely contributed to this gratifying result. It is a well-known fact proved in other parts of the world that increased prosperity amongst the population, resulting in better food and greater resistance to disease, together with an increase in the cultivated area in any district is usually followed by a decrease in the prevalence of Malaria.

"The following figures show briefly the incidence of this disease in the districts where the death rate is the highest and the lowest. The more detailed figures are given in the report of the Registrar-General :

"Total number of deaths from Malaria :—

Whole Colony	.. ..	1,004
Georgetown	.. ..	102
New Amsterdam	.. ..	16

"Highest Rate for Malaria per 1,000 deaths :—

Pomeroon	.. ..	428.6
North West District	.. ..	271.1
Demerara River	.. ..	241.7

"Lowest Rate for Malaria per 1,000 deaths :—

Mahaicony, E. Coast, Demerara	..	17.5 "
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GRENADA. **Medical Reports of the Charitable Institutions, etc., for the Year 1920.** [PATERSON (G. W.), Colonial Surgeon.]—41 pp. 1921. St. George: Printed at the Government Printing Office.

*Vital Statistics :*

The birth rate per 1,000 was 33·12; for 1919, 33·17  
 The death rate per 1,000 was 17·5; for 1919, 17·9  
 The average birth rate for the past decade was 35·91  
 The average death rate for the past decade was 20·08

“The present death rate (17·5), which is eloquent of the health of the colony, is the lowest since 1901, with the exception of that for 1916, which was the same as this.

“The percentage of deaths under five years was slightly higher than in 1919, being 43·9 as compared with 41·3; it was, however, lower than in 1918 and 1917, when the figures were 46·1 and 51·0 respectively. . . .

“There was an increase of the number of deaths from intestinal diseases as compared with the past two years, viz., 403, as against 347 and 281, but the number for 1917 was 382.

“The number of deaths under syphilis show a further marked reduction on previous numbers, 25 as compared with 38 and 80 for 1919 and 1918 respectively; a result, it appears to me, to be reasonably attributable to the beneficial effects of the venereal diseases campaign.

“The number of deaths from pulmonary tuberculosis (46) is by far the lowest since 1913, when the disease was first made notifiable.

“The number of deaths recorded this year from enteric fever (37) is the highest on record.”

*Yaws.*—“The intensive treatment of yaws in the districts by intramuscular injections of novarsenobillon and subsequent treatment orally by mercury and iodide of potash has been vigorously maintained. The following table presents the position for the periods stated:—

	For the year 1920.	From May 1918 to Dec. 1920.
Number of cases injected. .	5,049	8,188
Number of cases cured ..	3,797	5,069
Number of deaths ..	8	13
Expenditure for treatment	£3,326 6 3½	£5,064 15 10

“The above figures are creditable evidence of the volume of work performed by District Medical Officers. . . .

“The beneficial effects of this campaign are obvious, not only in the well-being of the patients concerned but in their enhanced labour value, a matter of no small moment to the community from an economic standpoint. The effect of injections on patients suffering from that condition of the disease known as ‘crab’ of the feet can only be described as spectacular, for, after a comparatively brief term of treatment, these patients, after varying long periods of inability to move about, regain the use of their feet and engage in some profitable occupation, thereby earning their livelihood and ceasing to be an encumbrance on their friends.”

**BASUTOLAND. Annual Report for the Year ending 31st December, 1920.** [LONG (E.), Principal Medical Officer.] [MS. Report received from the Colonial Office.]

" *Typhus fever* may now be regarded as endemic in the territory. During 1920 cases were recognised as far north as Teyateyaneng. Contrary to the usual experience in this disease cases were more numerous in the early summer than in the winter months. There were 547 cases and 94 deaths.

" The problem of dealing with typhus in a native territory like Basutoland where a large proportion of the inhabitants are domiciled in remote mountain villages is beset with difficulties. First and foremost is the factor of the wide prevalence of the body louse which is regarded by the people as a natural parasite, and they fail to understand why a parasite which has always been with them should be a source of disease. The overcrowding which obtains in most huts, the habit of visiting neighbouring villages, and congregating for beer drinks and local court cases, are also potent factors in the spread of the disease. . . . I estimate that at least four-fifths of the population (equal to 400,000 souls scattered over an area of 11,700 sq. miles) are lousy. . . .

" A better method would be to make the people help themselves with the assistance from the Government. If a law were passed making it an offence to be lousy, and the headman of each village was held personally responsible for the presence of lice on any of the people in his village, the delousing of the people would soon be an accomplished fact. Were such a law passed and rigidly enforced lice could be exterminated at the cost of the necessary insecticides and sterilizers which would be provided by the Administration. These latter could be established at suitable centres for the purpose of sterilizing blankets and clothing."

**CYPRUS. Annual Medical Report for the Year ending 31st December, 1920.** [THOMPSON (F. B.), Chief Medical Officer.]—26 pp. 1921. Printed at the Government Printing Office, Nicosia.

" *Leper Farm.*—The number of admissions to the Farm during the year was again very small as shown in the table given below. There were only 12 deaths, all of which were advanced cases of the disease. The number of inmates, at the close of the year under report, is the lowest on record. The beneficial effect of segregation is beginning to tell, and there is a prospect of stamping out the disease in Cyprus before long."

. . . . .

" The estimated population at the end of the year 1920 was 315,219. For the year 1919 it was 311,108.

" The total number of deaths was 7,330, the death rate per 1,000 living being 23·2 as compared with 18·5 in 1919.

" The total number of births registered during the year was 9,060, in 1919 it was 9,276. The birth rate per 1,000 of population for 1920 was 28·7, in 1919 it was 29·8.



"The death rate for infants under one year was 170.9 per 1,000, in 1919 it was 105.9."

## ABSTRACT OF SPLEEN RATE RETURNS.

	Total Ex- amined.	1	3	6	9	Spleen Rate.	Average Spleen.
For Oct., Nov., and Dec., 1919	32,396	30,681	1,533	154	28	5.2	1.0
For Oct., Nov., and Dec., 1920	37,953	35,073	2,481	313	86	7.5	1.1

*Note.*—The enlargements of the spleen are classed under 1, 3, 6 and 9 because these numbers are likely to give roughly the comparative sizes of the organ with no enlargement and small, medium, and great enlargement, respectively.

COLOMBO MUNICIPALITY. **Administration Report, 1920. Public Health Department.** [PHILIP (Wm. Marshall), Medical Officer of Health.] —45 pp. With 9 charts, 2 maps and 1 plan. 1921. Colombo: S. M. Johar, Municipal Printer.

As usual, this is the most interesting report we see. All Medical Officers of Health and Government Sanitary Officers in the tropics should obtain copies, as it is full of matters which are of great interest and importance. We regret that space prevents our doing it justice.

The birth-rate was 25.8 per 1,000; death-rate 29.1 per 1,000.

"*Principal Causes of Deaths.*— . . . Amongst the principal causes of deaths pneumonia was as usual the chief, with 1,106 deaths; next comes phthisis, with 729 deaths; diarrhoea and enteritis, with 605 deaths; infantile convulsions, 590 deaths; debility, 494 deaths; enteric fever, 338 deaths; influenza, 253 deaths; and plague, 209 deaths."

*Enteric.*—From 1907–14 there was a steady decrease; 1914–17, a slight increase; 1919, a severe outbreak due to adoption of rice depôts (see San. Supp. No. 1, 1921, p. 20); 1920: cases, 879; deaths, 338; case mortality, 38.45; death-rate, 1.21 per 1,000. As pointed out by Dr. Marshall Philip, the total number is obviously too small, because the case mortality is double that of the hospital-treated cases. There is no evidence of water-borne or milk-disseminated disease; hence carriers explain the cases.

"On 9th November, two cases were notified from a boarding house. On 18th November, another case was notified. On 19th November, 2 more were notified, while on the same day a case was notified from the other end of the town, who it was found had been in the habit of having meals sent from this boarding house although he did not reside there. Thus 6 cases in all were notified between 9th and 19th November, all of whom were found upon enquiry to have developed the disease and were therefore apparently infected at or about the same time, *i.e.* between 29th October and 1st November.

"Enquiry showed that neither the water supply nor the milk supply were responsible, but the evidence pointed to a mass infection of the food served in and sent out from this house. None of the inmates of the house either were then or recently had been sick, so it was thought that there might be a 'carrier' either amongst the boarders or more probably amongst the servants. Suspicion therefore fell upon one of the boarders who it was found had suffered from a mild attack of Enteric fever about

nine years previously. He, as well as the cook and five other servants who handled the food, were accordingly examined bacteriologically by Dr. Hirst, with, however, negative results in every case. It was therefore decided to search further afield. It was ascertained that salads containing uncooked lettuce were frequently served at the table, and attention was accordingly turned in that direction. The supplies of vegetables were said to be generally purchased from one particular stall in the nearest public market. This stall was accordingly visited and was found to be in charge of a Sinhalese woman and her daughter E. N. a rather sickly looking girl of 16 years of age. This girl E. N. was at the time actually engaged in breaking up lettuces. Inspector LaBrooy who was conducting this part of the enquiry next visited the home of these people, where he ascertained that both E. N. and her younger sister had suffered from Enteric fever about three months previously, E. N. having been treated at the Enteric Hospital. On enquiry at the Hospital it was found that E. N. had been admitted as a patient on 24th July, and had suffered from a very severe attack of the disease, including three haemorrhages. She was discharged cured on 7th October, after a stay of nearly ten weeks in the Hospital. This girl, three other sisters and the mother were now all subjected to a bacteriological examination with the result that although all the others gave a negative result E. N. was found to be discharging enormous numbers of Enteric bacilli in her excreta; she was in fact an acute Enteric 'carrier' and was therefore the probable source from which the infection of all the series of cases mentioned had been derived.

"As this girl obviously was a very grave source of danger to the public so long as she remained infectious and was allowed to continue her employment of handling vegetables in the public market, her mother was, with some difficulty, induced to consent to her removal to the Enteric Hospital where she was treated for three weeks, and then discharged after being proved by bacteriological examination to be free from infection."

*Plague.*—This part of the report is of very great interest and importance.

"The total number of cases reported during the year was 239, as against 89 in 1919, 4 of the cases in 1920 having been admitted to hospital from districts outside the town. 223 or 94·9 per cent. of the cases proved fatal. 93 cases were of the purely septicaemic type, all of which as usual died, while 142 or 59 per cent. were bubonic, of which 130 or 91·5 per cent. died."

Plague is more common in young male adults than amongst females, young children, and the old. This is explained by the fact that the young men sleep near the cookroom, which is usually riddled with rat holes. The females occupy the inner and comparatively less rat-infested rooms.

"Persons sleeping upon beds raised well above the floor level comparatively seldom acquire plague, even when living in the heart of a plague-infected area. A striking illustration of this is to be found in the case of the Afghans in Colombo, who always sleep upon extraordinarily high beds, and who are scarcely ever attacked by plague, although they live for the most part in one of the worst plague-infected areas of Slave Island."

Plague was introduced into Colombo from Negapatam. In January 1914 human plague broke out, rat plague having been present for some time previous to this, probably introduced in December 1913.

#### *Plague in Relation to the Grain Trade.*

"By the end of April, 1917, *i.e.*, in three years, the incidence of the disease had been reduced to such an extent as to be almost negligible as a cause of deaths, and so remained for 2½ years, *i.e.*, until September, 1919, when it suddenly broke out again with unusual severity.

"The facts in regard to this recrudescence in 1919 are of especial interest in that they afford a striking illustration of the dangerous association between plague and grain trade as the following shows.

"When the supplies of Indian rice suddenly failed in May, 1919, and the existing stocks became dangerously low, the grain merchants began in July to import large quantities of other kinds of grain by way of substitutes for the rice. The abnormally large quantities of these other grains thus imported is shown in the following statement, the details of which were kindly furnished by the Principal Collector of Customs.

## IMPORTS OF GRAIN OTHER THAN RICE.

	Average prior to rice troubles.	1919.	1920.	1921.
January	.. 28,858 ..	—	.. 153,315 ..	.. 26,740
February	.. 25,788 ..	—	.. 182,040 ..	.. 24,501
March	.. 21,955 ..	—	.. 32,451 ..	.. 21,977
April ..	.. 29,165 ..	—	.. 22,474 ..	.. 30,692
May ..	.. 23,949 ..	—	.. 22,705 ..	.. —
June ..	.. 24,067 ..	—	.. 51,118 ..	.. —
July ..	.. 30,258 ..	61,053	.. 71,374 ..	.. —
August	.. 22,069 ..	146,903	.. 58,836 ..	.. —
September	.. 32,471 ..	57,350	.. 72,363 ..	.. —
October	.. 35,624 ..	136,514	.. 80,721 ..	.. —
November	.. 27,040 ..	43,216	.. 82,592 ..	.. —
December	.. 18,826 ..	92,478	.. 48,831 ..	.. —
TOTAL ..	—	537,514	.. 878,820 ..	.. 103,910
Monthly Average	26,000 ..	89,586	.. 73,235 ..	.. 25,977

"The special danger in so far as Plague was concerned, in connection with this great increase in the importation of these other grains lay in the fact that whereas the whole of the imported rice supplies went from the ships into the Government Granaries which were specially designed to prevent rat infestation, the imports of all grain other than rice went direct into the rat-infested stores and boutiques throughout the town. There was thus accumulated in the busiest and most populous parts of the town a freely accessible and practically unlimited supply of ideal rat food, which, as is well known, invariably leads to an increase of the rat population which has been found to vary in accordance with the amount of food available. This increase of the rat population, involving as it necessarily did an increase in the proportion of young and therefore non-immune rats, was all that was required for the occurrence of an outbreak of rat Plague which, according to the records of cases found, began in September, 1919, and was in due course followed by an unusually severe outbreak of human Plague in the succeeding months."

"The facts in regard to this further outbreak at the end of 1920 are also of special interest in that here again we have another but apparently somewhat different example of the association between Plague and grain, the explanation of which appears to be as follows:—

"When Food Control was established in May, 1919, the whole of the retail trade in rice which had up till then been carried on in some 967 boutiques distributed all over the town, was taken over by the Food Control Department, and was thereafter concentrated in and strictly confined to a series of some 64 dépôts which were conducted by the staff of the Municipal Council. This particular source of rat food was thus very much curtailed, since not only were the dépôts very few in number compared with the boutiques but they were for the most part located in isolated sheds and bungalows, the stocks in which were completely changed each day, and as nothing but rice was dealt with in these dépôts, rats had little opportunity of obtaining shelter or multiplying there, and were

as a matter of fact seldom seen. The establishment of this rice depôt system, although by no means an unmixed blessing as the experience in connection with Enteric and Measles shows, was therefore very unfavourable to Plague, and but for the importation of other and uncontrolled kinds of grain as stated above, there can be little doubt that instead of an increase there would have been a decrease of Plague in 1919. As it was, the incidence of the disease remained low from February till September when, however, it again broke out with unprecedented severity, the explanation of which is believed to be as follows:—

"The supplies of Indian rice had increased by the middle of 1920 to such an extent that it was decided to abolish the depôt system, and this was done on 1st September, 1920, whereupon the whole of the retail trade in rice at once passed back into the hands of the boutique keepers, with the result that these small shops, of which there were 967 in the town, laid in stocks of rice in addition to the other food supplies in which they deal. As experience in anti-plague work has shown, these rice boutiques are an unfailing source of attraction for rats and are invariably heavily infested, so that this sudden accession of rice greatly enhanced their rat breeding capabilities and thereby greatly increased the danger of plague, which as stated above broke out with unprecedented severity during the succeeding months."

Another interesting fact also ascertained was that Prince Street (one out of 166 streets) had never been free from plague for twelve successive months. On investigation it was pointed out that this was the centre of an industry for sorting and mending old grain sacks. Preventive measures in the shape of sunning the bags, pesterining the floors and fumigating and filling up rat holes, were adopted.

Then follows a note by Mr. BAMFORD on "Plague and its correlation with Meteorological Factors."

"Mr. Bamford's report confirms the observation that Plague tends to increase in Colombo in times of low (dry bulb) temperature and of high humidity, and he draws attention to certain departures from this rule which have occurred, and the explanation of which must therefore be sought in the existence of non-climatic conditions."

*"Plague in relation to season."*—From what has been said in regard to Plague in relation to climate, it follows that Colombo having an exceptionally equable temperature throughout the year, the incidence of Plague here does not show such marked seasonal variations as occur in most other Plague infected countries. On the basis of the statistics for the seven years 1914–1920, the normal "Plague season" in Colombo may be said to start with the North East Monsoon in September, reach its maximum in December, and end with the onset of the hot weather towards the end of April, while the "off plague season" lasts conversely from April to October, the minimum being reached in May, with however a slight but distinct tendency towards an increase in June–July, following the South West Monsoon."

We will deal with Dr. HIRST's note on the water supply in another place.

**MADRAS. Annual Report of the Health Officer of the City of Madras for the Year 1920.** [SINGARAVELU (C.), Officiating Health Officer.] —140 pp. With 3 charts and 2 plates. 1921. Madras: Printed by S. Murthy & Co., at the "Kapalee" Press, 305, Thambu Chetty Street.

Death-rate, 41·3 }  
Birth-rate, 41·3 } Calculated on the 1911 census.

*Vaccination.*—"The amount of protection against smallpox conferred by vaccination is well illustrated in the table below. Of 240



attacks amongst the vaccinated, 71 or 29·58 per cent. died, whereas there were 65 attacks and 38 deaths amongst the unvaccinated, the percentage of deaths being 58·46."

The most interesting part of the report concerns the Infant Welfare Work, which appears to be well organized.

"Out of a total of 1,154 live births conducted in the scheme in 1919, the deaths under one year were 267, giving thus an infantile death rate of 231·1 as against a death rate of 280·4 per mille for the city for 1920."

**STRAITS SETTLEMENTS. The Municipality of George Town, Penang, Straits Settlements. Health Officer's Annual Report for the Year 1920.** [ROSE (J. Stuart), Municipal Health Officer.]—pp. 33 + 3. 1921. Penang: The Criterion Press, Ltd. [Price not stated.]

Birth-rate, 30·67 per mille.

Corrected death-rate, 32·82 per mille.

Infant mortality, 205 per 1,000 children born. Of 681 infants, 181 died within seven days of birth.

**PHILIPPINE ISLANDS. Report of the Philippine Health Service for the Fiscal Year from January 1 to December 31, 1920.** [DE JESUS (Vincente), M.D., Director of Health.]—497 pp. With 11 folding charts and 19 plates. 1921. Manila: Bureau of Printing.

"What sanitation has done for the City of Manila is shown by the reduction of its general mortality from 48·83 per thousand in 1904 to 26·47 per thousand in 1920. Our next endeavor should be to achieve like benefits in the provinces . . . by the establishment of water-works systems, the drilling of artesian wells, and digging of sanitary wells, and, with the increasing efforts to establish sanitary closets, public as well as private. . . .

"Among the first and most important problems with which the service has to deal is infant mortality. . . . We have other work of no less importance, . . . ; such as the campaign which was started last year for a general systematic vaccination. . . . The vaccination against cholera was started about the beginning of this year and its results were so promising that the appearance of a cholera epidemic on a large scale like those which occurred frequently in the past, will not, in all human probability, be repeated. The struggle to prevent typhoid by means of anti-typhoid vaccination, augurs hopefully. . . . The treatment of lepers . . . at the San Lazaro Hospital forebodes success in the future, and the work . . . will undoubtedly redound to the benefit of the 5,000 lepers who are segregated in Culion and also to the others at large. . . . There are other health problems no less important. . . . We should not, however, be too impatient. . . . We should continue working and striving until . . . our country will be a safe place wherein nationals and foreigners alike can live peaceably and well."

Death-rate: Provincial, 20·67; Manila City, 30·07.

Infant mortality lowest on record: in Manila, 161·54, average last five years, 326·3; province as a whole, 156·9.

*Smallpox*.—4,300,000 doses of vaccine used. Manila City, 241,289 vaccinations. Dried vaccine gave a very good result in provinces.

*Cholera*.—"As a supplementary measure to standard methods of fighting the disease, anti-cholera vaccination has been resorted to, especially in those places where cholera has become endemic,

and also in those places where sporadic outbreaks of the disease occurred. Contacts and other persons who had been exposed to the disease or who habitually failed to maintain personal prophylaxis have been given preferential attention. A total of 185,000 anti-cholera vaccinations have been performed throughout the Islands without a single case of accident having been reported."

Typhoid is still very prevalent.

There is an interesting report on the treatment of leprosy that will be dealt with in another place.

MEDEDEELINGEN VAN DEN BURGERLIJKEN GENEESKUNDIGEN DIENST IN NEDERLANDSCH-INDIË. 1920. Pt. 11. pp. 4-75. With charts, maps and Appendices. [In Dutch & English.] **Uittreksel uit het Verslag over den Burgerlijken Geneeskundigen Dienst van 1911 t/m 1918. Extract of the Report of the Civil Medical Service from 1911 to 1918 inclusive.**

This publication is the annual report of the medical services in Dutch East Indies. It is a volume of great interest to all administrative sanitary officers, and heads of departments in British colonies should obtain copies either through their respective Governments or direct. The report is printed in English as well as Dutch so that it can be read by all.

*Collection of Vital Statistics in Rural Areas.*—"With regard to the technical side of the registration, the following may serve. The smallest administrative unit in Java is the *desa* (village); this, however, as a rule has a too small population to give a decent curve, since one single death more or less causes a considerable rise or fall. Therefore, for our purpose the sub-district has been taken as unit, with an average population of 20,000. The heads of the *dessas* receive booklets from the Inspector of the Civil Medical Service for noting the names of the new-born and of the deceased. On the weekly *kumpulan* (meeting) with the assistant *Wedono* (native magistrate), collective charts are made up from those booklets, and are sent to the Inspector, in whose office the figures are worked up into curves and statistics. The extent of this work is obvious from the fact that Java has 1,500 sub-districts, of which 3,000 figures (of birth and death) are sent in weekly; moreover, the 4-weekly, the quarterly and the yearly figures are calculated; for one year this is making 140 calculations per sub-district, or for all Java 210,000 calculations."

*Small-pox Vaccination.*—This appears to be done on two systems: (1) In the parts where calf lymph is not available arm-to-arm work is done; in this area each vaccinator makes a complete tour of his district in 13 weeks. (2) In places where laboratory lymph can be used, the operator completes his primary vaccination work in seven or eight weeks and utilizes the remainder in revaccination work.

*Plague.*—"In 1913 the fumigating of houses as a means of combating the disease was introduced, but after some years this measure was given up and they mainly restricted themselves to the means that proved most satisfactory after all, viz., the systematic improvement of houses, in consequence of which the epidemic a.o. in the province worst affected, the division Malang, was stopped entirely. The principles according to which this improvement of houses was regulated are to be looked for in a booklet edited by the Anti-Plague Service."

*Cerebrospinal Meningitis.*—"Special mention deserves the experience that, when the men of the Police of the Depot at Sukibumi, among whom this disease raged, were moved to the island of Onrust and lodged in spacious sheds, the disease suddenly vanished, to reappear, when the less spacious abodes at Sukibumi again had to be moved into."

Experience in Africa and India entirely confirms this observation.

*Malaria.*—The writer goes over very much the same ground as that reviewed on pp. 1-3 in this number. "If the many problems still unsolved that appear in combating this disease, are not cleared up beforehand, and consequently measures are taken at random, the odds are, as it has often appeared in this country too, that no other result is obtained than a fruitless withdrawal of money from the community and unnecessary trouble to the population.

"Indeed compelled by the so-called 'God-Sakers' (as people, who keep on urging 'for God's sake let us do something' are called in British-India) extensive grounds have been cleared of jungle and bushes, at the cost of much money and labour, in the hope of freeing the district of malaria with no other result than that the malaria was seen to spread with unabated violence, and that moreover the funds reserved for the combating were lost."

. . . . .

*Chenopodium Oil.*—"An examination of the oil manufactured in this country from the imported *Chenopodium ambrosoides*, has shown that it equals the American product in expellent power. Popular booklets have next incited some private agricultural estates to take in hand the culture and manufacture of this aetheric oil. In various rubber-gardens the chenopodium shrub is now being planted between the hevea in this country. Seeing that the manufacture of aetheric oils from plants is an industry not unknown to the people, various distilling apparatus of easy construction were suggested. It is an encouraging phenomenon, that already now offers have been made to supply the oil manufactured in this country at 10 per cent. below the market price."

*Beriberi.*—"In the army, in agricultural and mining estates, in prisons, the success of this change of diet [from polished to unpolished rice] has been striking. The beriberi hospital at Buitenzorg still bears the name, but the beriberi patients, mainly coming from the miners of the Banka tin mines, have disappeared and made way for the disabled, the incurable and the aged."

The report also gives much valuable matter concerning the organization of laboratories, native medical schools, midwife nurses' training centres and many other subjects of interest. It contains graphs of vital statistics and some fine maps.

BREINL (A.). **A Comparative Statistical Inquiry into the Prevalence of Diseases, Death Rates, Infantile Mortality and Birth Rates in Queensland.**—*Med. Jl. Australia.* 1921. Sept. 3. 8th Year. Vol. 2. No. 10. pp. 173-184. With 15 charts and 1 map in text.

This is an instructive review, but like all statistical investigation it is almost impossible to review it, for without the graphs anything

we could say by way of comment would not be intelligible. The author's own summary is as follows:—

“ For the purposes of a comparative statistical inquiry, Queensland, with the exception of the far north, a district extending from Port Douglas to Thursday Island, was divided into six districts, three coastal and three inland, situated in approximately the same latitude, representing southern, central and north Queensland. As a unit for comparison the decade between 1902 and 1911 was adopted, as the population figures could be considered fairly accurate on account of the census having taken place in 1901 and 1911; hospital admissions and hospital case mortality rates, district death rates and birth and infantile mortality rates were calculated.

“ (1) On the whole the average figures for hospital admissions to the northern hospitals were much higher than for the southern districts, but it could be proved that this fact is mainly due to an increased use of hospital facilities. On the whole, the average death rates are practically the same in the northern and in the southern districts. Average birth rates are approximately the same in all coastal districts, but are lower in the central and northern inland districts, which fact may find its explanation in the smaller number of women of child-bearing age.

“ (2) The average infantile mortality rate for the northern coastal district is lower than that for the central or southern district and is practically identical for the three inland districts.

“ (3) The statistical inquiry has proved that north Queensland, as far as vital statistics are concerned, does not differ essentially from central and south Queensland and compares favourably with Victoria and Tasmania.”

It may be pointed out that the results are obtained from white population only, living between the latitudes of  $27^{\circ}$  and  $17\frac{1}{2}^{\circ}$ .

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## MISCELLANEOUS.

INDIAN ENGINEERING. 1921. Oct. 22 & Nov. 5. Vol. 70. Nos. 17 & 19. pp. 234 & 262.—**B.-N. R. Type of Staff Quarters for Indians.** With plans.

Medical officers in tropical countries not infrequently want housing accommodation for subordinates and do not know where to go for a sound design of a house. We consider that the set of plans published are about the best we have met with: they are simple and comfortable houses and not very high-priced. Indian railways, cannot be charged with extravagance in the housing of their personnel, but the best of them know the value of good housing, both from a health point of view and for the contentment that it brings.

*B.-N. R. Type of Staff Quarters for Indians.* (Figs. 28-31.)

"A set of type drawings designed by the Chief Engineer of the Bengal-Nagpur Railway to accommodate the various grades of Indian employees of that Railway.

"Type C. E.'s No. 9367A is allotted to junior clerks, timekeepers, etc., and provides per unit, a front verandah, two living rooms 12 ft. 6 in. by 8 ft. 4 in. and 11 ft. 8 in. by 10 ft., a verandah with cooking facilities, a courtyard with a screened bathing-place and a latrine.

"Type 9367B is allotted to clerks, assistant station masters, signallers, etc., and provides per unit, a front verandah, two living rooms 12 ft. 6 in. by 11 ft. 8 in. and 12 ft. by 10 ft., cook-room 7 ft. 8 in. by 4 ft. 10 in., inside verandah and a courtyard with screened bathing-place and a latrine.

"Type C. E.'s No. 9367C is allotted to Station Masters and provides, per unit, a front verandah, two living rooms 15 ft. by 11 ft. 8 in. and 11 ft. 8 in. by 11 ft. 4 in., a store-room and a cook-room, each 6 ft. 8 in. by 5 ft. 10 in., inside verandah, and a courtyard with screened bathing-place and a latrine.

"Type C. E.'s No. 9367D is allotted to Overseers, Senior Indian Station Masters, etc., and provides, per unit, two living rooms each 12 ft. 6 in. by 11 ft. 8 in., one living room 11 ft. 8 in. by 10 ft., a front verandah, cook- and store-rooms, each 6 ft. 8 in. by 5 ft. 10 in., inside verandahs, courtyard and screened bathing-place and a latrine.

"The types are so designed that they can be built either in single unit or in blocks of a suitable number of units as required."

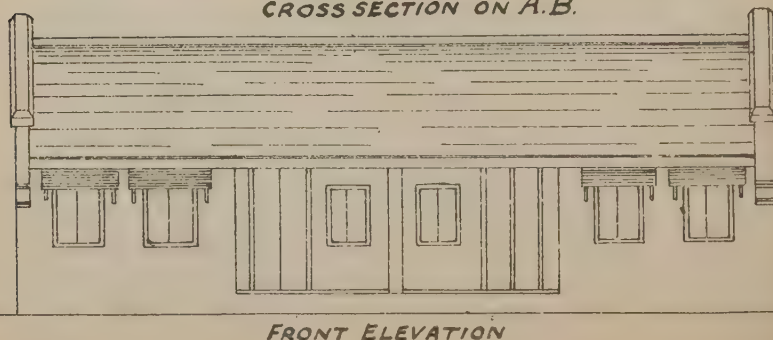
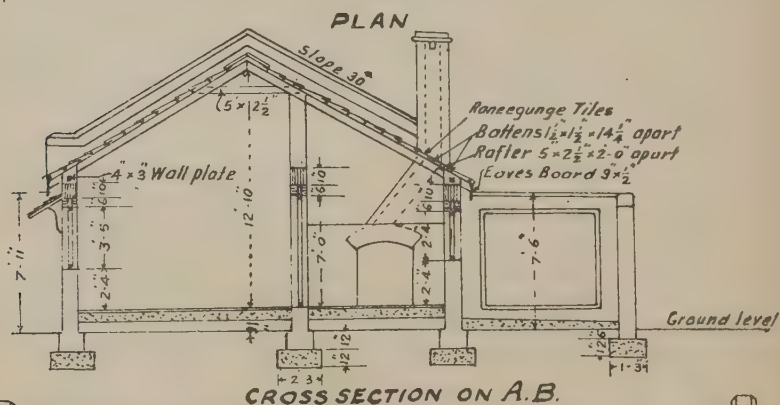
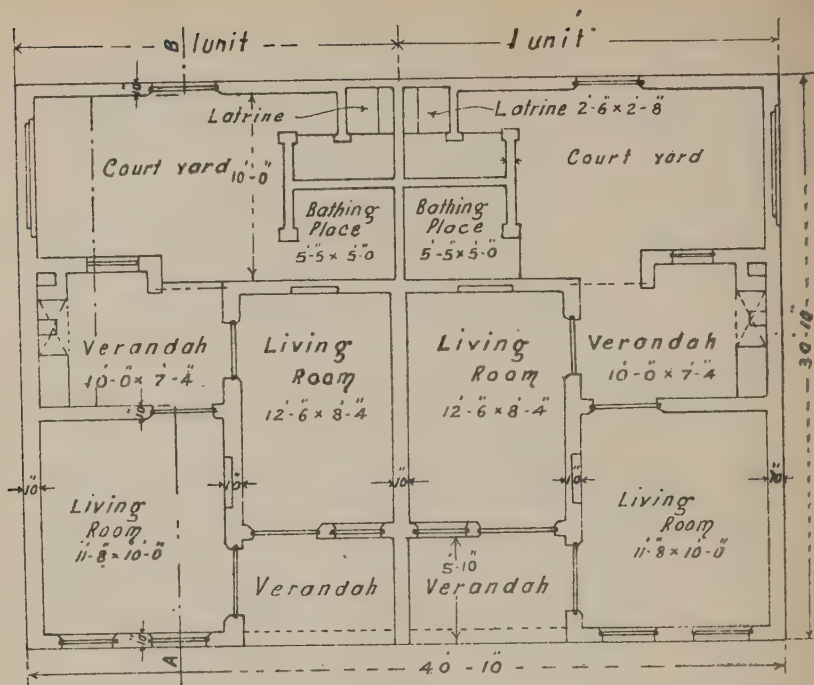
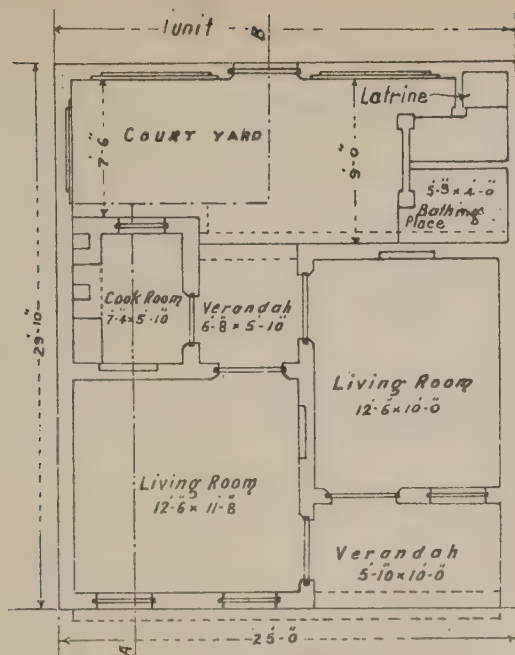
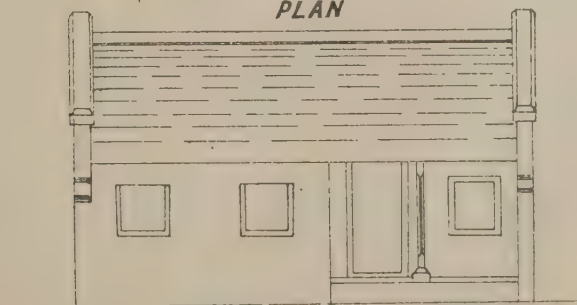


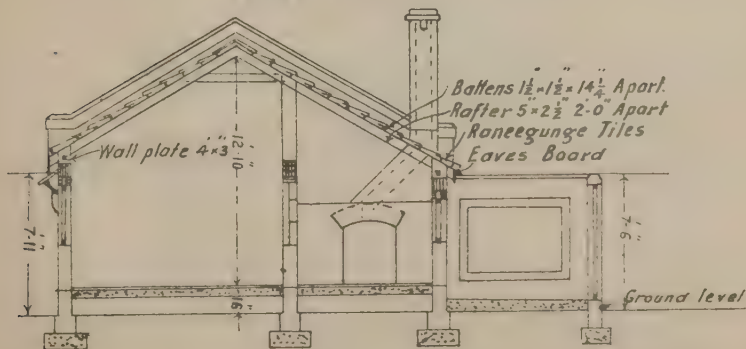
FIG. 28.—B.-N. Ry. Type of Staff Quarters for Indians. [Junior Clerks, Timekeepers, etc.] C. E.'s No. 9367A.—Type A. (Reproduced from Indian Engineering.)



PLAN



FRONT ELEVATION



CROSS SECTION ON A.B.

FIG. 29.—B.-N. Ry. Type of Staff Quarters for Indians. Clerks, Assistant Station Masters, Signallers, etc. C. E.'s No. 9367B.—Type B. (Reproduced from *Indian Engineering*.)

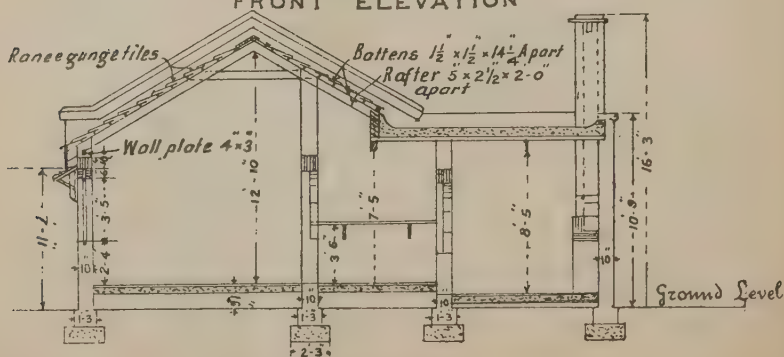
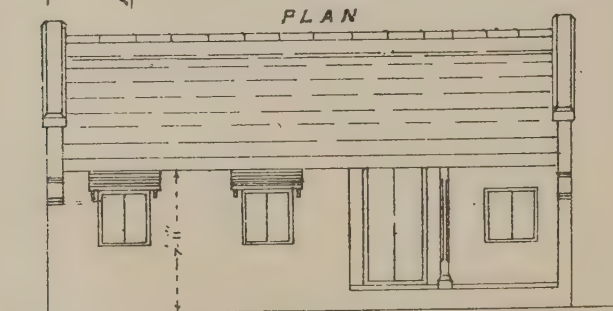
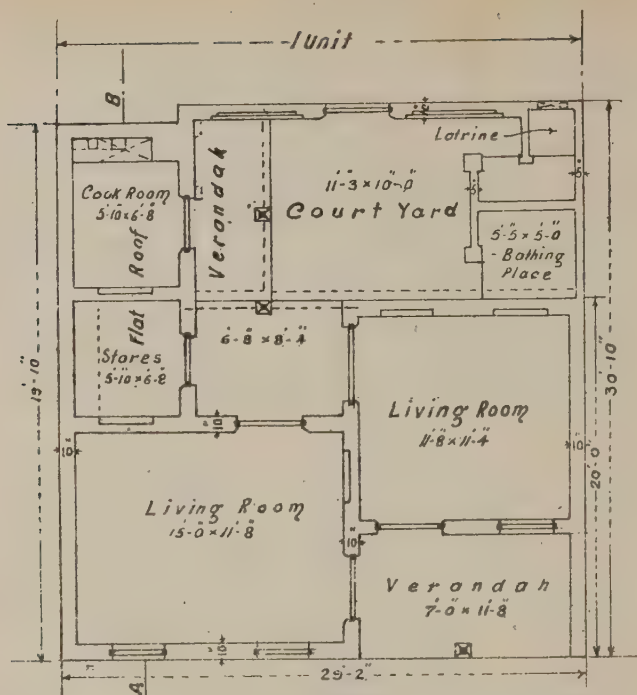
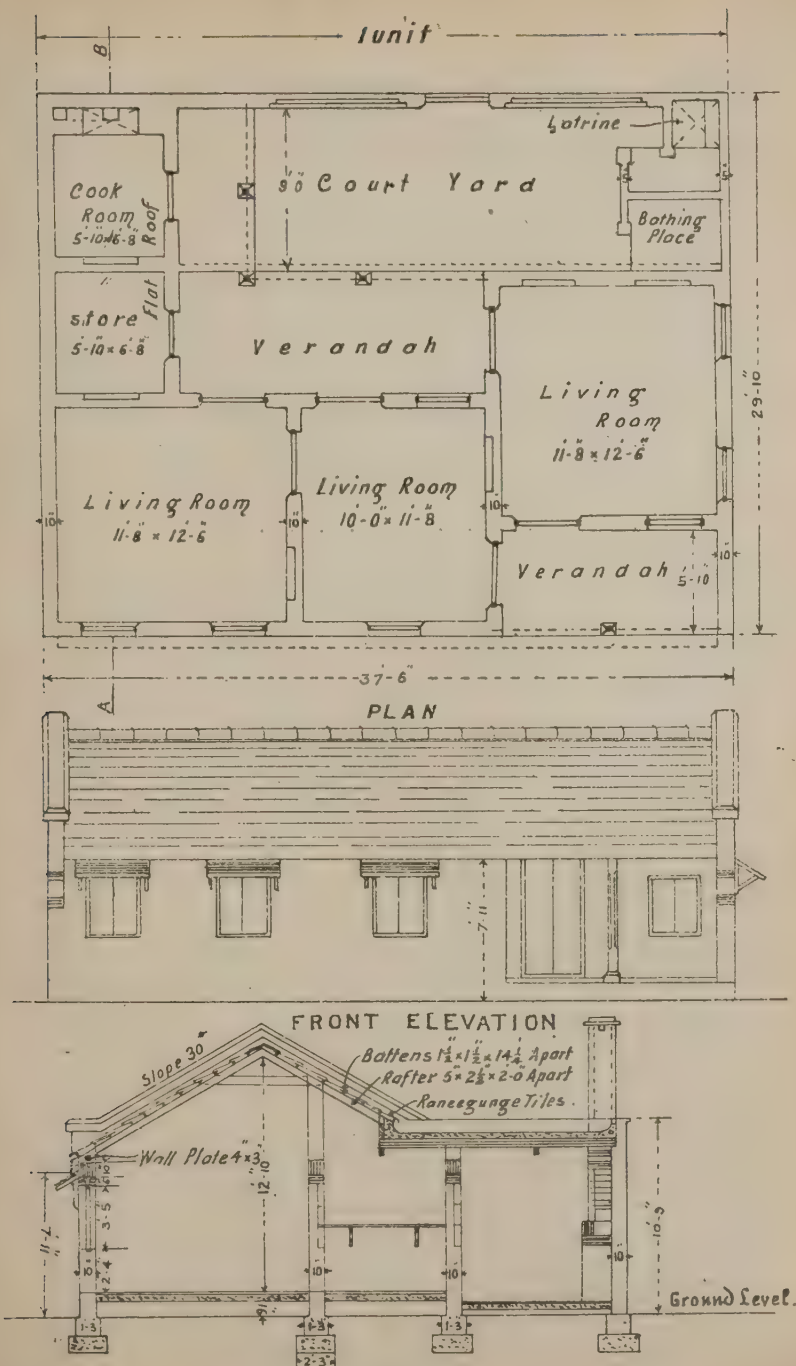


FIG. 30.—B.-N. Ry. Type of Staff Quarters for Indians. [Station Masters.]  
C. E.'s No. 9367C.—Type C. (Reproduced from Indian Engineering.)





SECTION ON A.B.

FIG. 31.—B.-N. Ry. Type of Staff Quarters for Indians. [Overseers, Senior Indian Station Masters, etc.] C. E.'s No. 9367D.—Type D. (Reproduced from *Indian Engineering*.)

READE (Charles C.). **Town Planning in British Malaya.**—*Surveyor*. 1921. Sept. 23. Vol. 60. No. 1549. pp. 201–202.

The author has been town planning in Australia and in other countries and is now engaged in Malaya. He deals with the difficulties of the problem, though not very fully with their remedy.

“Much good work by committees and boards has been accomplished, but the difficulties to be faced, I find, are not merely the preparation of suitable plans and schemes within the means of the Government and sanitary boards, or the making of the preliminary civic surveys beforehand, but the inadequacy of existing powers and machinery when it comes to dealing with economic and administrative questions relating to resumptions, methods of rating and valuation of land, also exchanges and redistribution of ownerships, etc. Much attention has therefore had to be given to these aspects, and one result is that the Government is now introducing legislative changes by way of amendments to existing Acts which should assist towards overcoming future difficulties. Town-planning legislation is, of course, also required.

. . . . .

“The Government, recognising that many of the preliminary inquiries and proposals must delve deeply into the administrative side of town planning, has given every assistance for working out actual plan schemes in addition. The staff of the Government town-planner at present consists of: (1) Engineer with town-planning knowledge; (2) architect with town-planning knowledge; (3) draughtsmen and tracers (Asiatic); (4) chief clerk; (5) assistant clerk, typist, office peons, etc. Co-operation with different departments dealing with lands and survey, public works, railways, anti-malarial drainage, sanitary boards and local government executive engineers, is having excellent results in saving time and marshalling the essential preliminary data without which one can do but little.

“The Government has also appointed an influential State Advisory Town-Planning Committee, comprising the British Resident of Selangor (chairman), the general manager for railways, the director of public works, principal medical officer, surveyor-general, and others. Several schemes have been approved by the committee, including a new factory area for Kuala Lumpur, which is now in process of being carried out. Several important firms have already taken up blocks in this area.

. . . . .

“In this and other eastern countries there is a very difficult problem to overcome in replanning and redistribution, partly owing to the awkward shapes into which holdings have been surveyed, but chiefly due to the fact that the lands are frequently owned by Chinese, Malays and Indians. Under the Bombay Town Planning Act city planners will know of the replanning schemes inspired by German examples that are now being worked out there on a system of debit and credit based on compensation and betterment. The last word in this method has not been said. It is rather complex, and leads more to regroupings of ownerships to suit private individuals than to any proper planning productive of sociological as well as economic betterment. The architects, I fear, would find little of those aesthetic principles without which we are like mariners minus beacons.”

- i. SNIJDERS (E. P.). **Rubbercultuur in Nederlandsch-Indië—Bedrijfs-hygiëne.** [Rubber Industry in the Netherlands East Indies—Industrial Hygiene.]—61 pp. With 10 figs.
- ii. ——. **Koeliehuisvesting en Geneeskundige Dienst op Rubber-ondernemingen.** [Coolie-Housing and Sanitary Service on Rubber Estates.]—53 pp. With 32 figs.
- Reprints from: *Handboek voor de Rubbercultuur in Nederlandsch-Indië* [*Handbook for the Rubber Industry in Netherlands East Indies*]. Druk de Bussy.

In these semi-popular articles the author has given a very good general review of the sanitary conditions on the rubber estates of Sumatra and of the great advances made during the last 20 years. Great difficulties had to be overcome, not the least of which was, and still is, the peculiar mental attitude of the Eastern populations, which is more bent on momentary personal comfort than on general hygiene, of the advantages of which they have little conception. This particular difficulty is clearly demonstrated by the difference in the morbidity statistics of the estates with "free" coolies and those with "contract" coolies. The "free" coolies, after their day's work, return to their own villages with their notoriously low standard of hygiene. Consequently they show a very high morbidity and death-rate. On the estates in the thinly populated parts of Sumatra coolies had to be imported on "contract." Housing and food were provided for them on the estates, but even so the mortality in the early years, 1880-89, was very high (70-100 per thousand) and in bad years even reached the appalling figures of 200 per thousand. Tropical medicine was then in its infancy. After 1889 came the great change. Under the able guidance of SCHÜFFNER and his colleague KUENEN great progress was made in sanitation. Well-built central hospitals with a capacity for 4-5 per cent. of the total number of coolies, well-equipped laboratories with skilled assistants, strict medical examination of the coolies at the place of recruiting as well as after disembarkation, card-indexing of all the people on the estates, etc., all tended to produce a steady and considerable drop in the mortality figures, which from 1905 onwards has been as low as 100 per 10,000 on some of the better managed estates. The principles of modern quarantine, isolation of infectious cases and inoculation, of soil-sanitation and mass treatment for ankylostomiasis, the antimalaria campaign, the importance of vitamins and many other problems well known to all workers in preventive medicine, are shortly and clearly described. In the chapter on Plague a number of excellent diagrams illustrate the different models of rat-proof roofs.

In his second article the author deals with the sanitation of the coolie camps. In the earlier days of the plantations any odd corner of the estate was considered good enough as a site, and little attention was paid to the construction of the houses thereon. The great ravages wrought by devastating epidemics, however, have taught the owners a hard and expensive lesson, and now due consideration is given to the desiderata for a healthy camp, viz., high ground, with good exposure to sunlight and air currents, sufficient water supply, efficient sewage disposal, no adjacent Anopheles breeding places, etc., etc. All these different points are discussed and their pros and cons considered. The papers are illustrated by clear diagrams and instructive photographs. The second part is devoted to the construction and equipment

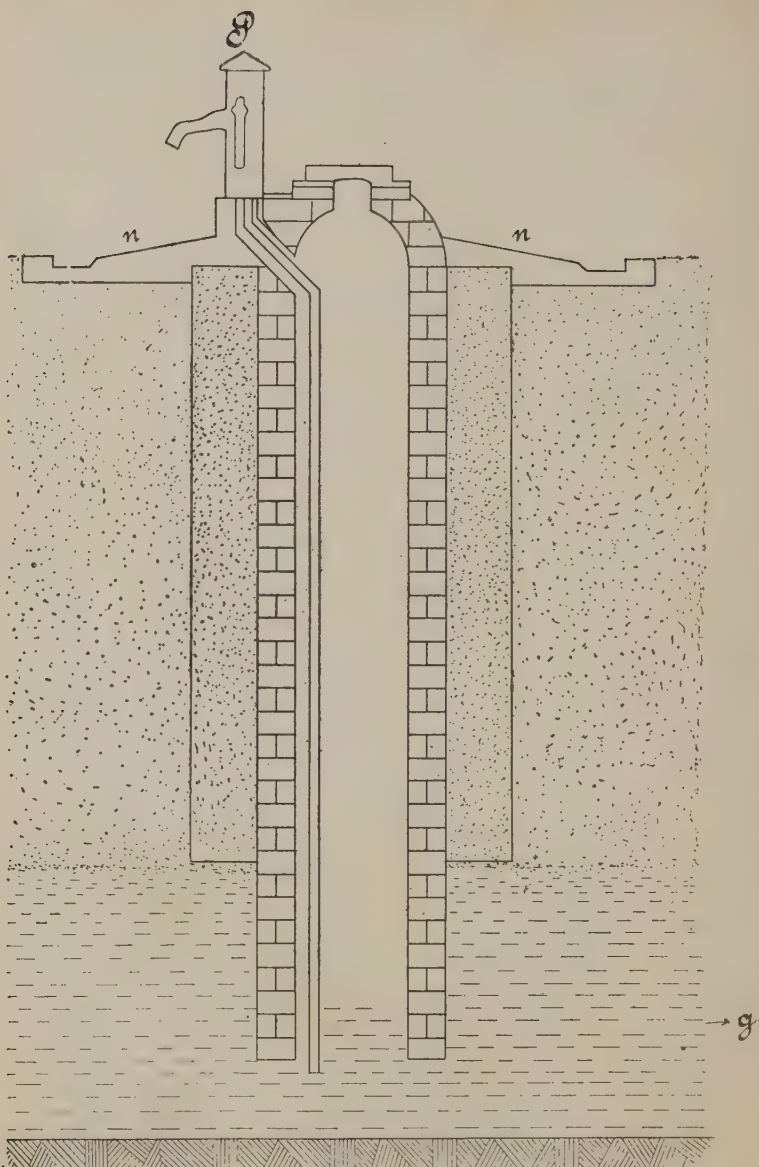


FIG. 32.—(After FLU: Tropenhygiëne). Correctly constructed well.—Soundly steened walls reach right down into the ground water, and protect the well from pollution by unfiltered surface water.

P.—Pump, with conduit pipe extending below the steening into the deepest part of the well.

n.—Cemented area round well, with good slope and gutter. The well is completely closed in.

g.—Groundwater.

[The above and the succeeding figures (33–53) are reproduced from the *Handboek voor de Rubbercultuur in Nederlandsch-Indië*.]



of the hospitals and coolie-lines, plans of several of which are reproduced: It is evident that a high degree of efficiency has been attained. Although there is still room for improvement, much has been achieved by the close co-operation between the planters and the medical staff. The Central Hospital, where all the newcomers on their arrival are thoroughly examined and the sick and doubtful cases segregated for treatment and further observation and the sick from the estates are sent, has become a very powerful weapon in the economic management of the estates.

These articles, though not in the first place written for medical men, make interesting and instructive reading.\*

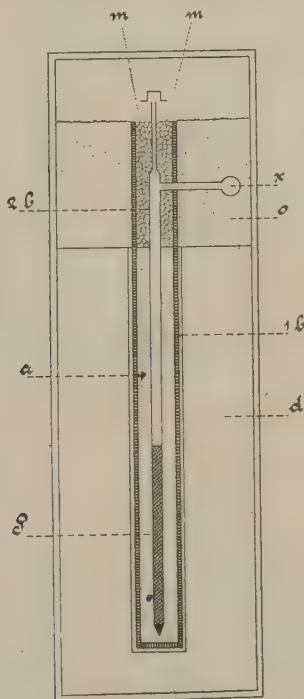


FIG. 33. NORTON well (after SALTET :

*Leerboek der Hygiëne*).

*o*—Upper earth stratum.

*d*—Lower earth stratum.

*1 b*—First bore tube.

*2 b*—Norton bore tube with terminal portion covered with gauze.

*a*—Gravel between earth and Norton bore.

*mm*—Masonry work to keep surface water from reaching the gravel *a*.

*x*—Tube leading to pump.

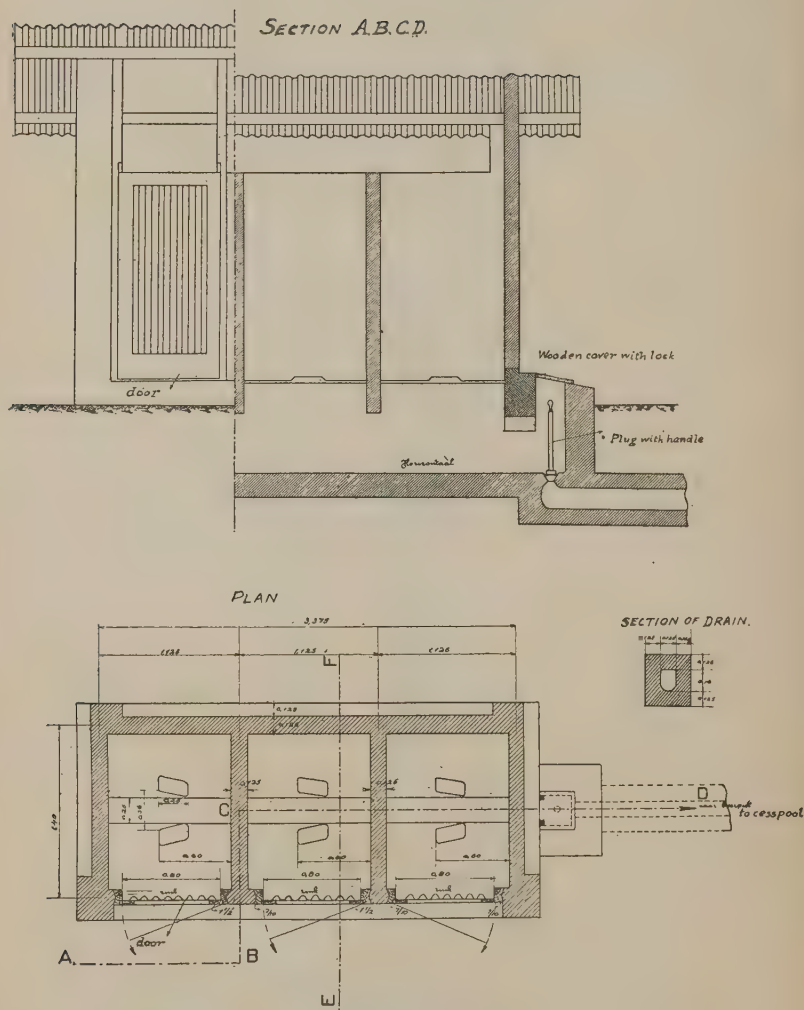


FIG. 34.—Latrine showing Drain and Plug construction devised by CLEMESHA.

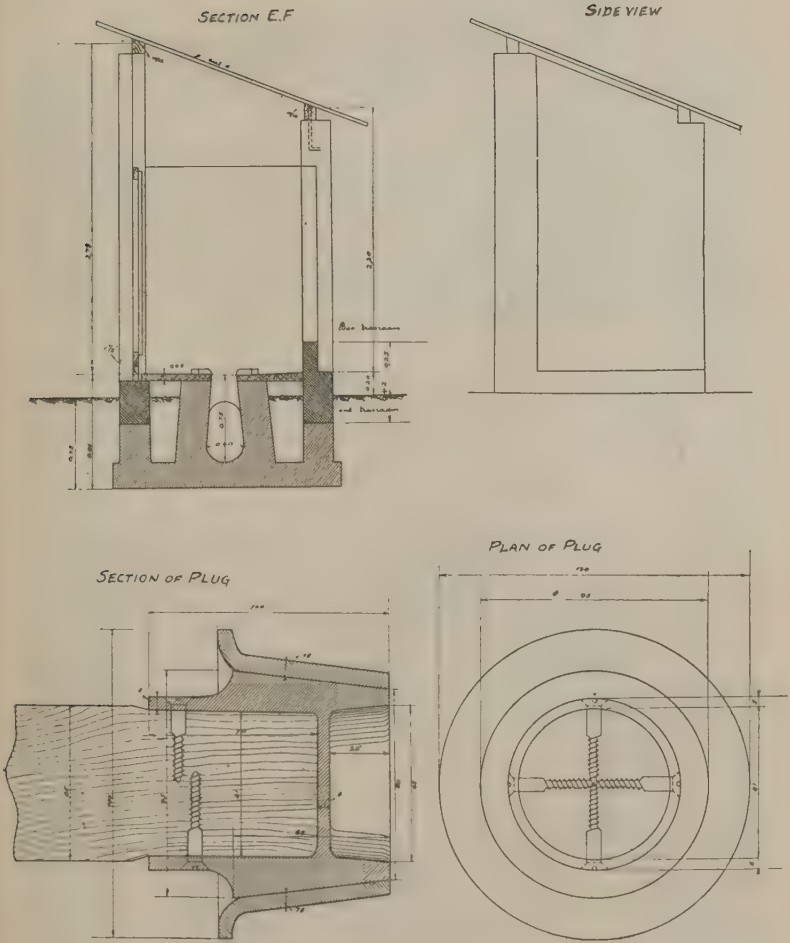


FIG. 35.—Latrine showing Drain and Plug construction devised by CLEMESHA.



FIG. 36.—Coolie lines on the Senembah Company's Estate. Note the windows and doors and lofty but shallow verandahs (*kaki lima*) which allow plenty of light. Also the large end windows for upper lighting, the wide ventilation spaces between the main roof and the walls, and the ridge ventilation. The building is of wood with "atap" roofing. It is light and airy, and if the floors were cemented and the roof made rat-proof it would be very satisfactory.



FIG. 37.—Stone Coolie dwellings (*pondoks*) of the Deli Company. The cooking places are on the verandah (*kaki lima*). Note the broad ventilation space between roof and walls. (This shows an old model. In the newer models windows are provided, and the verandahs are cemented.)





FIG. 38.—Coolie "Garden City" dwelling of the Batavian Petroleum Company. A house for two families, entirely rat-proof and provided with latrines with septic tanks and good drinking water. Cost per family = f11,000 (about £83).

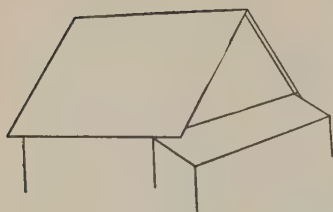


FIG. 39.—“Saddle” roof and “reading-desk” roof. The simplest and therefore the best types.

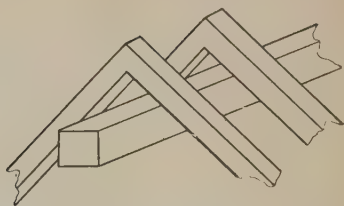


FIG. 40.—Faulty ridge construction. Rats can nest in the space between the roof-tree and the rafters when breadth of roof-tree exceeds 5 cm.

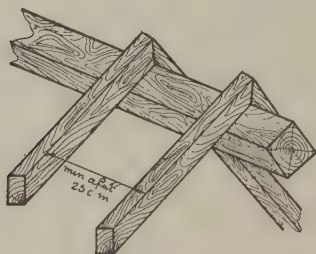


FIG. 41.—Sound ridge construction.



FIG. 42.—Sound construction for zinc, corrugated iron or “sirap” roofing (with “rider”).

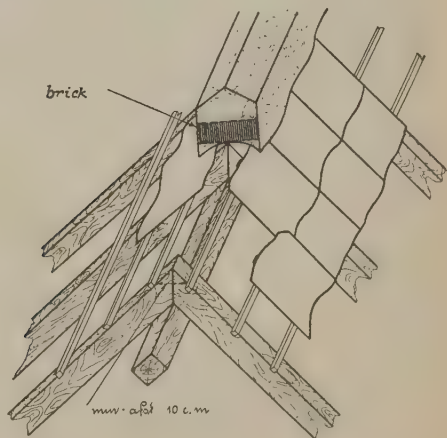


FIG. 43.—Soundly constructed tiled roof with brick work ridge (the space between ridge and roof-tree must not be completely filled.)

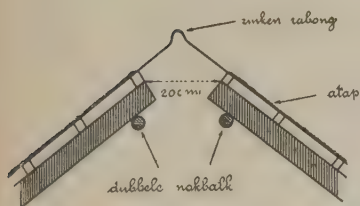


FIG. 44.—Showing simple construction with double roof-trees (for zinc, "sirap" or "atap" roofing).

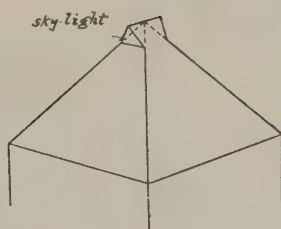


FIG. 45.—Pointed roof with skylight. Top well lighted and easily inspected. The hip-rafters do not all four meet at the same point.

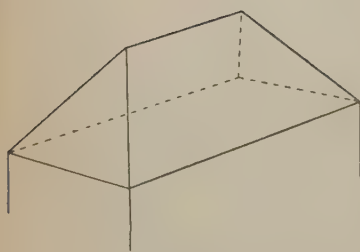


FIG. 46.—"Shield" roof. More complicated in construction and therefore less satisfactory than the "saddle" roof.

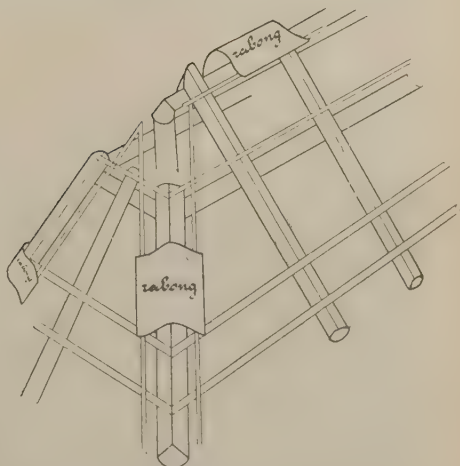


FIG. 47.—Simple form of construction of a "shield" roof. The hip-rafters do not go right up to the roof-tree, and between the "rabong" and the roof-timbers there is an easily inspected space, especially if the roof tree and rafters and the underside of the "rabong" are whitewashed.

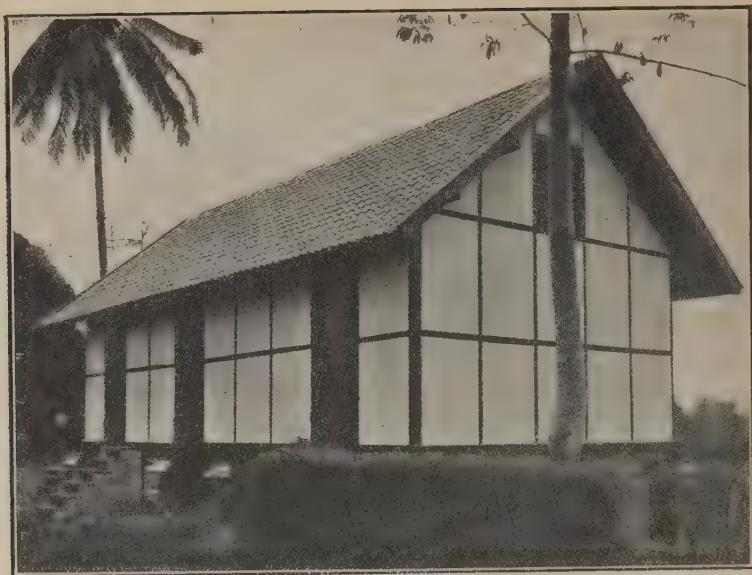


FIG. 48.—Rat-proof rice godown at the Bangkattan Hospital. Note the rat-shields on the pillars (75 cm. above the ground), the detached steps and the sloping roof timbers. When the door opens the lower half falls outwards on to the detached steps, thus forming a gangway which is automatically removed when the door is closed.

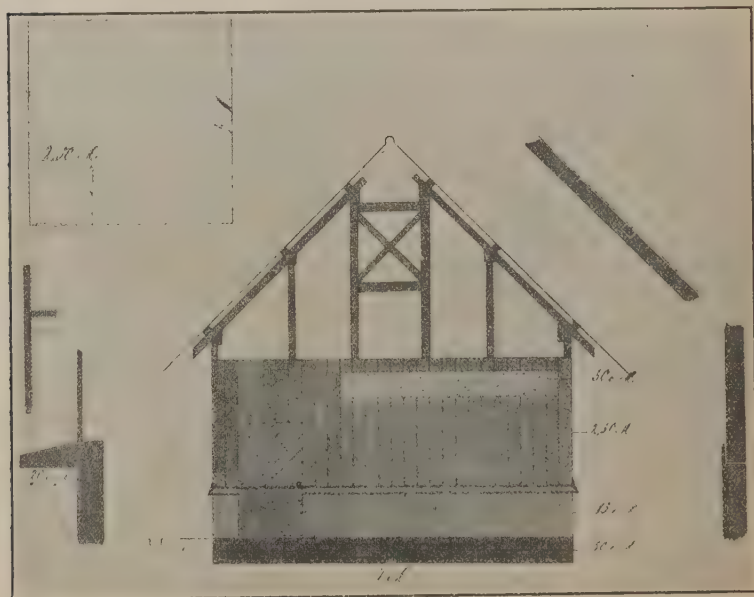


FIG. 49.—Rat-proof rice godown, with sulphur fumigation space (after BAERMANN). Note the footing of the wall sunk at least 50 cm. below surface, the lower part of cement (20 cm. thick and rising at least 75 cm. above the ground), and the double roof. The floor is of cement and at least 10 cm. thick.





FIG. 50.—Screened Ward in the Bangkattan Hospital of the Deli Company.



FIG. 51.—Ward in the Hospital of the Holland-American Plantation Company at Kisaran. Lofty and Cool.

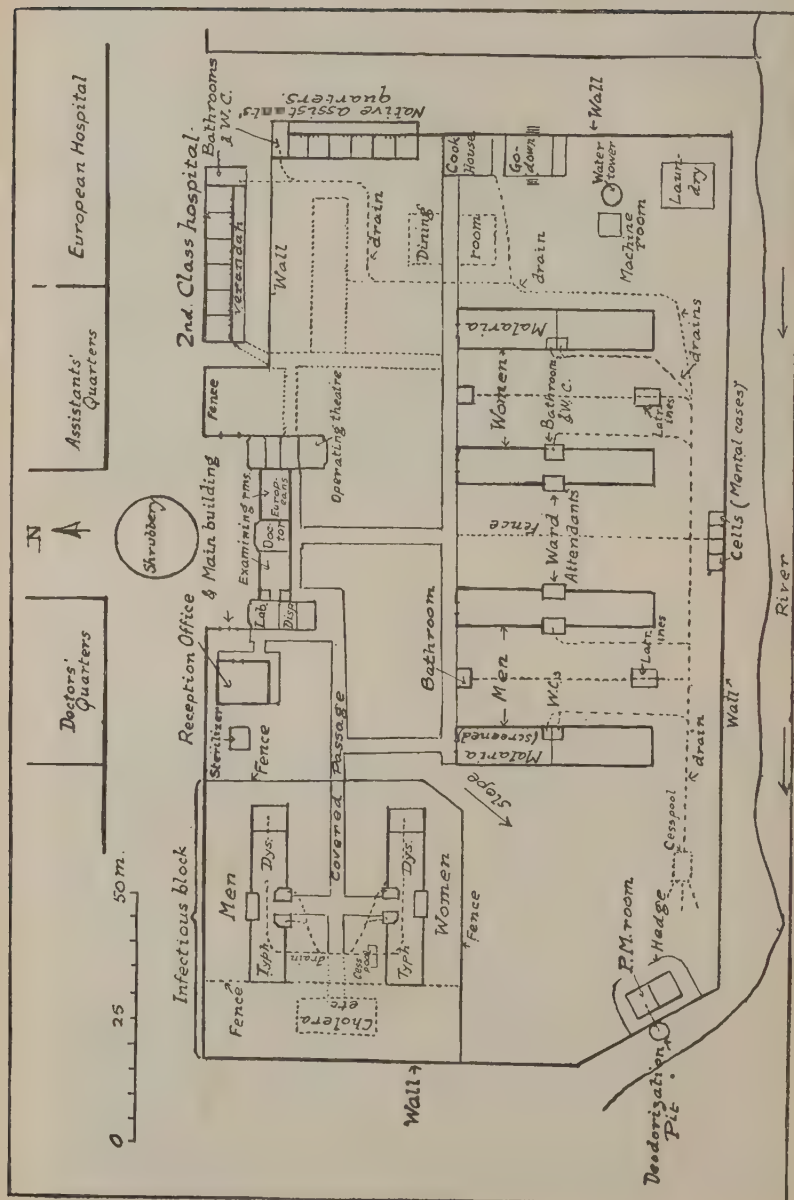


FIG. 52.—Sketch Plan of the Centraal Hospitaal (200-500 patients), Sumatra.

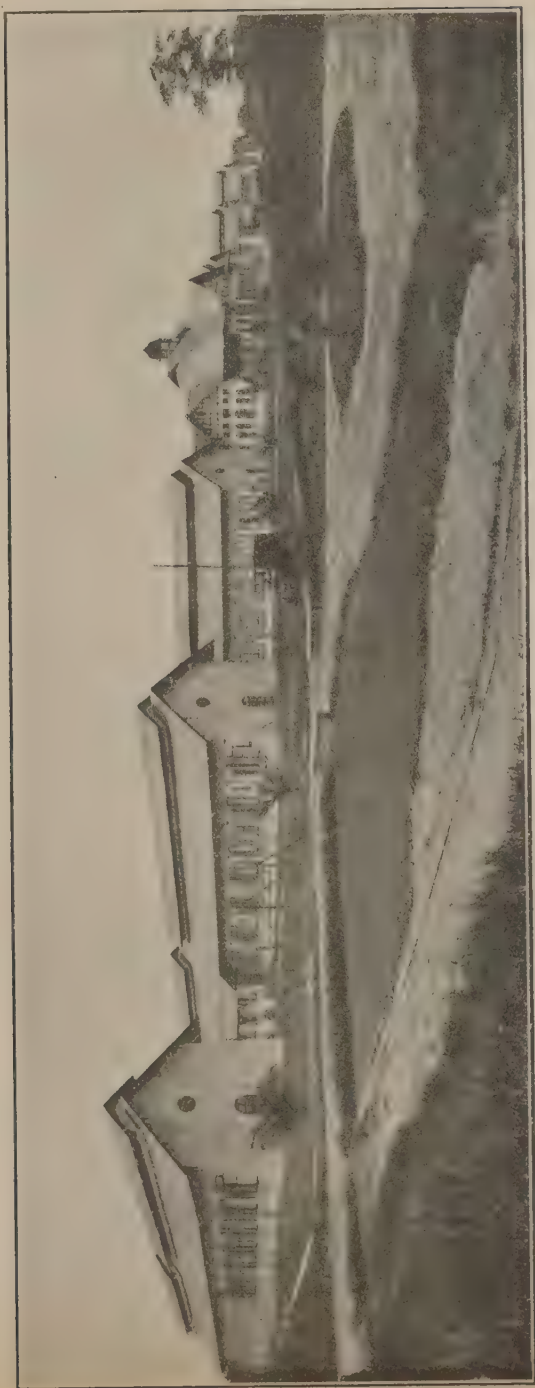


FIG. 53.—General view of the Hospital of the Holland-American Plantation Company, Kisaran.  
(Figs. 32 to 53 are reproduced from the *Handboek voor de Rubbervcultuur in Nederlandsch-Indië*.)

SAVAGE (William G.). **The Methods used for the Inspection of Canned Foods and their Reliability for the Purpose. Part I.—Canned Meats.**—Special Report No. 3. 23 pp. Department of Scientific and Industrial Research. Food Investigation Board. 1920. Reprinted 1921 H.M. Stationery Office. [Price 9d. net.]

This paper contains a critical survey of the methods used by food inspectors in England in the examination of canned foods. The rejected tins were submitted to further careful examination in the laboratory in order to ascertain the actual number of bad tins among those thrown out.

The methods used by the inspectors were: inspection of the tins, palpation for springy feeling due to loss of vacuum, percussion with a piece of wood or finger, and shaking. Rejects fall into four categories:—

Group A.—Rejected by the trade examiners, but passed by Food Inspectors.

Group B.—Rejected as doubtful and unsafe to pass.

Group C.—Rejected as definitely unfit.

Group D.—Samples not included in above groups.

"If we take all the four groups and consider only the opinions of the Port Food Inspectors we obtain the following summary:—

Judgment.	No. of Samples.	Meat Good.		Meat Unfit and Bacteria Isolated.
		Sterile.	Not Sterile.	
Passed as good .. ..	16	15	0	1
Passed (but would open some of batch No. 96)	1	0	0	1
Rejected as doubtful ..	11	9	1	1
Rejected as unfit ..	46	22	10	14
	74	46	11	17

"Since the Inspector guarded his judgment of sample No. 96 by saying that although he considered it good he would open some of the batch to see, it is difficult to summarise this sample and it is perhaps best excluded.

"Excluding it we obtain the following:—

Judgment of Food Inspectors.	No. of Samples	Meat Good and Sterile.	Meat Good not Sterile.	Meat Unfit.	Percentage in which Judgment correct based on	
					Condition of the Meat.	Sterility.
Passed ..	16	15	0	1	94	94
Rejected ..	57	31	11	15	26	45·6
	73	46	11	16	41	56



"These figures are striking. When these experienced inspectors passed a tin they were almost invariably right (94 per cent.), when, however, they condemned one they were only right in 26 per cent. of cases judged by the goodness of the meat and in 45·6 per cent. if absolute sterility is the criterion. In these cases, as already explained, the meat was good and the bacteria present scanty and unimportant and there was no reason why it should not be eaten. The 26 per cent. figure is therefore the more correct of the two. In 74 per cent. of the rejected tins, therefore, the condemned meat was quite fit and good to eat."

We find that the opinion of the inspector errs on the side of strictness.

The author then deals with the infected tins and points out that in reality many of these are quite fit for food. Classifying tins into,

"(1) Those which are satisfactory when judged by an outside physical examination.

"(2) Those which show evidence of internal pressure—'blown.'

"(3) Those which are leakers and potentially unfit.

"Groups (1) and (2) offer no difficulty, but group (3) forms a large and important class which offers great difficulties in practical work. . . .

"The original reject was 35·3 per cent., the reject when a percentage of the retained tins was gone through by the Food Inspector was at the rate of 10·4 per cent., and the actual percentage unfit was 1·3."

The paper should be in the hands of all officers whose duty it is to supervise inspection work.

BRITISH MEDICAL JOURNAL. 1921. Sept. 24. pp. 493 494.—**The West Indian Medical Conference.**

The Medical Officers of the West Indies seem to have had a most successful conference, many interesting papers were read and a large number of resolutions passed. Many of these deal with local problems and service matters which, though very important to the West Indies, need not be given at length here. It is, however, noteworthy that the conference considers that the disease alastrim, recently epidemic in Jamaica, should be treated as smallpox, and research into its nature undertaken. Also that revaccination of the populace should be brought into force.

WATERMAN (Jason) & FOWLER (William). **State Laws and Regulations pertaining to Public Health, 1917 and 1918.** Supplements Nos. 37 and 38 to the *Public Health Reports*. United States Public Health Service. Treasury Department. 582 pp.; 412 pp. 1920. Washington: Government Printing Office.

Both these volumes give the additional health legislation enacted during the years mentioned for all States of America, Philippines, Hawaii, etc. All interested in this subject should obtain copies. Legal enactments cannot be reviewed intelligibly.

INDIAN ENGINEERING. 1921. Nov. 12. Vol 70 No. 20. pp. 269 270, —**Water-Logging.** [Note on a Punjab Irrigation Technical Blue-book by F. W. Woods, C.I.E., Chief Engineer.]

"The Punjab has really very little excuse for many of its meanderings and excursions in the water-logging matter. It has its object lesson for all time in the old Western Jumna canal. As long ago as

1867 General Strachey wrote in very forcible terms of an evil that had been talked about for 25 years, of the pestilential swamps, destructive to the health and life of the population, and of the moral obligation which rested on Government to put an end to the discreditable condition of a large area of country. Never had any canal-irrigated tract been so disastrously water-logged, and no tract has ever been in such a condition since. Canals and water courses obstructed the drainage lines, and in addition there were natural obstructions. A natural drainage line is not necessarily perfect in its operations, and pestilential swamps may occur where there are no canals. It was not merely that the tract was heavily irrigated, there was the rainfall, often very heavy rainfall. It was not after dry weather and very extensive irrigation that the evils were at their worst; on the contrary it was after wet weather, and little irrigation because there had been much rain, that the swamps and ill-health were most pronounced. The remedies that were applied in the eighties of the past century were entirely successful. They consisted in the main of the clearance from all obstructions, whether artificial or natural, of the drainage lines to a definite outfall. The reclamation may have been assisted by the subsequent canal extensions leading to more economical use of water for irrigation; but the drainage system in itself was well conceived, and it led to an immediate and remarkable improvement in the conditions of the tract concerned.

. . . . .

" 'It cannot be emphasized too strongly,' Mr. Woods said, 'that neither percolation flow from canals into the sub-soil nor inundation flow of rivers nor flow off of rainfall over the ground surface is objectionable or a source of injury to animal or vegetable life or health. It is only the *stagnation* of such flow, caused by natural or artificial obstructions to flow, that produces deleterious results.'

" The above are strong words, but they are no *ex cathedra* statement. They are founded on evidence, and land-drainage operations should be the sheet anchor. With efficient surface drainage to prevent many collections of stagnant water, and a commanded area of a canal sufficiently large to automatically enforce a reasonable economy in the use of water for irrigation, it is confidently believed that little would be heard of the evils that canal irrigation is supposed to bring in its train."

FRANCIS (Edward). **Tularaemia Francis 1921. 1.—The Occurrence of Tularaemia in Nature as a Disease of Man.**—*Public Health Rep.* 1921. July 29. Vol. 36. No. 30. pp. 1731-1738.

— & MAYNE (Bruce). **2.—Experimental Transmission of Tularaemia by Flies of the Species *Chrysops discalis*.**—*Ibid.* pp. 1738-1746.

— & LAKE (G. C.). **3.—Experimental Transmission of Tularaemia in Rabbits by the Rabbit Louse, *Haemodipsus ventricosus* (Denny).**—*Ibid.* pp. 1747-1753.

The following summary of the above papers is reproduced from the United States Public Health Service Health News:—

" Jack rabbits, lice, and certain kinds of horseflies (*Chrysops discalis*) are all shown, in three papers recently published by the U.S. Public Health Service, to be instrumental in the transmission to man of the infectious disease of rodents now christened tularaemia, because it is characterized by the presence of *Bacterium tularensis* in the blood.

In the first paper Dr. Edward Francis, of the Public Health Service, reports on investigations and experiments in Utah in the summer of 1920, by which he demonstrates that the disease exists among jack rabbits, to which it seems very fatal, and is transmitted to man by a blood-sucking horsefly, which obtains it by biting the jack rabbit, and passes it on by biting the man.

In the second paper Drs. Francis and Bruce Mayne describe the successful experimental transmission of the disease from rabbit to rabbit by the bite of a horsefly (*Chrysops discalis*).

"In the third paper Dr. Francis and Dr. G. C. Lake, also of the Public Health Service, describe their discovery that the jack rabbits were infested with lice and offer abundant experimental evidence that these lice spread the disease among the jack rabbits. The practical importance of this experimental transmission is that it explains how the infection is kept alive from year to year in Utah.

"Tularemia is seldom fatal to man, only one death due to it being known. It is, however, a disabling septic fever, occurring in Utah, which lasts from three to six weeks, and from which convalescence is slow. Its economic consequences to its victims may be serious, because it attacks farmers and field workers and lays them up for two or three months in the busy midsummer and harvest seasons, when the fly carrier is most prevalent."

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#### THE FENCE OR THE AMBULANCE.

(By Joseph MALMS.)

" 'Twas a dangerous cliff, as they freely confessed,  
Though to walk near its crest was so pleasant ;  
But over its terrible edge there had slipped  
A duke and full many a peasant ;  
So the people said something would have to be done,  
But their projects did not at all tally,  
Some said, ' Put a fence round the edge of the cliff ' ;  
Some ' An ambulance down in the valley.'

" But the cry for the ambulance carried the day,  
For it spread through the neighbouring city ;  
A fence may be useful or not, it is true,  
But each heart became brimful of pity  
For those who slipped over the dangerous cliff ;  
And the dwellers in highway and alley  
Gave pounds or gave pence, not to put up a fence,  
But an ambulance down in the valley.

" Then an old sage remarked, ' It's a marvel to me  
That people give far more attention  
To repairing results than to stopping the cause,  
When they'd much better aim at prevention.  
Let us stop at its source all this mischief,' cried he.  
' Come, neighbours and friends, let us rally,  
If the cliff we will fence we might almost dispense  
With the ambulance down in the valley.' "

(From the *Texas State Jl. Med.* 1921. July. Vol. 17. No. 3. p. 171.)

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## BOOK REVIEW.

WATSON (MALCOLM). [M.D., C.M., D.P.H., Chief Medical Officer, Estate Hospital's Association, Klang, F.M.S.] **The Prevention of Malaria in the Federated Malay States: A Record of Twenty Years' Progress.** With contributions by HUNTER (P. S.), M.A., M.B., D.P.H., Deputy Health Officer, Singapore, and WELLINGTON (A. R.), M.R.C.S., L.R.C.P., D.P.H., D.T.M. & H., Senior Health Officer, F.M.S.; and a Preface by Sir Ronald Ross, K.C.B., K.C.M.G., F.R.C.S., D.P.H., M.D., LL.D., D.Sc., F.R.S., Nobel Laureate. xxvii.+381 pp. With illustrations. Second Edition, Revised and Enlarged. 1921. London: John Murray, Albemarle Street, W.1. [Price 36s. net.]

The first edition of this book was originally intended as a contribution to my "Prevention of Malaria," but was finally published separately by the Liverpool School of Tropical Medicine in 1911 and paid for by the subscriptions of a number of planters' companies in the Federated Malay States. The second edition is much larger than the first one, and is an imposing volume, finely printed on good paper and profusely illustrated with excellent photographs. As it is a record of more than twenty years' work—in a line, of malaria-prevention in plantations on a large scale—it deserves a copious review.

I find that mosquito-reduction against malaria was cursorily suggested by me in letters to LAVERAN, MANSON, and Surgeon-General STERNBERG, the Head of the American Army, in 1898, after my work on the cultivation of *Proteosoma* of birds in mosquitoes had been completed, and my similar work on human malaria had been postponed by the Indian authorities for investigations on kala azar. On the 16th February, 1899, I reported at length on the same subject to the Director-General, Indian Medical Service. This letter was published in the *Indian Medical Gazette* for July, 1899 (with a heading which I did not give to it). The *British Medical Journal* of the 1st July, 1899, printed a lecture delivered by me in Liverpool in the preceding month repeating the same suggestions at greater length; and the same *Journal* for the 9th, 16th, 30th September, and 14th October, 1899, next published a series of communications "from a Correspondent" (namely myself), describing the exact method of applying mosquito-reduction in Freetown, Sierra Leone—where the carrying mosquitoes are *Anopheles costalis* and *funestus*. I had hoped that these papers would have been quickly followed by practical mosquito-reduction in many parts of the world; but nothing was done in this line during 1899 and 1900—unless general drainage of marshes can be put into the same class. In 1901, however, four campaigns were started almost simultaneously. Assisted by Dr. Logan TAYLOR, I gave an object lesson in the work at Freetown with the help of £2,000 given to me expressly for the purpose by Mr. James COATS, Junior, of Paisley. Almost simultaneously Surgeon and Major GORGAS, of the American Army, had commenced exactly similar work against mosquitoes in Havana, in consequence of the discovery, made at the end of 1900, that yellow fever is carried by *Stegomyia calopus*. At the same time Dr. J. C. THOMSON, of the Medical Department of the Hongkong Civil Service, began work of the same kind there, and Dr. Malcolm WATSON commenced his labours at Klang, in the Federated Malay States. Of course, our work in Freetown was merely a private effort which was not meant to be continued for more than a year. The work at Hongkong remained very successful for a series of years. The work at Havana was a brilliant victory against yellow fever, and, as everyone knows, was followed by the similar campaign of GORGAS at Panama. The work in the Federated Malay States has been continued with similar results, but under much greater difficulties; and the book under review describes the findings and results up to date.



The American campaigns had many difficulties to contend with. Havana is a large city which had been allowed to fall into a very bad sanitary condition, and the Canal Zone at Panama was a rural area consisting of thickly wooded hills and valleys with innumerable small marshes and an enormous rainfall. But GORGAS had behind him the immense resources of the United States, and was therefore able to spare no expense in carrying out his projects. The difficulties in the Federated Malay States were even greater. The country was covered by jungle, the rainfall is very great, the ground is sometimes flat and sometimes hilly, the labour is mostly derived from the poorest classes in India, and the available funds are merely those which can be spared out of somewhat humble budgets for ordinary sanitation. The first steps of the work will be found fully reported upon in the *Journal of Tropical Medicine* for the 15th September, 10th November, 1st December, 1903, 1st April, 1904, and 2nd July, 1906.

The first move was the reduction of malaria in the town of Klang (of which Malcolm WATSON was Medical Officer) and was undertaken under the Government, the Sanitary Board, and the State Surgeon (Dr. E. A. O. TRAVERS). The methods employed were careful eradication of breeding-places and certain drainage measures; and the result was very encouraging, as shown by the death-rates and the sick-returns of Klang compared with those of the surrounding country, and also as shown by the examination of numbers of children within and without the Klang area. Next year, therefore, the same measures were extended to Port Swettenham—with equally good results. At the same time further studies were made on the local mosquitoes by Dr. G. F. LEICESTER in his *Culicidae of Malaya* (*Studies from Institute for Medical Research, Federated Malay States, 1908, Vol. III., Part 3.*).

Watson now began to extend his ideas to the plantations in the hinterland, to some of which he had become medical officer. The difficulties can be imagined. Some of the estates were suffering severely from the disease, and were so impoverished that they could scarcely afford money for dealing with it, while the Government had enough to do with its own obligations. Nevertheless, by constant efforts and with the assistance of many of the leading planters, medical men, officials, and entomologists, especially Dr. C. STRICKLAND, he has been able to show in this book very worthy results indeed.

Of course in new ventures of this kind mistakes are made over and over again, and often have to be rectified at considerable cost; but each mistake brings, when corrected, new knowledge and a new hope of final victory. The author divides the territory which he has had to deal with into five tracts—the Mangrove Zone, the Coastal Plain, the Coastal Hills, the Inland Plain, and the Inland Hills. In each tract the disease is carried by a different species of *Anopheles* and each species has to be considered by itself and dealt with by different measures. Of course, where the tide submerges the coast, the Mangrove Zone cannot be malarious at all; but beyond that limit *A. ludlowi* begins to breed in the thick jungle. This mosquito is easily dealt with merely by clearing the forest and by cultivating the cleared ground—so that mosquito-reduction in this case is actually profitable, apart from the saving in labour. The Coastal Plain is haunted by *A. umbrosus*, which also breeds in jungle, and can scarcely emerge from it; so that the same measures suffice for the reduction of this species also. In the Inland Hills, however, quite another problem presented itself. They are not malarious when they are covered with virgin jungle, because *A. umbrosus* does not live in the ravines; but they are intensely malarious when open, because *A. maculatus* then appears in the little streamlets and runnels of water coming down the sides of the hills. Hence when the jungle was cut from these hills the malaria was actually intensified; and the author has dealt in an illuminating manner with this very unexpected difficulty. It is a troublesome and expensive matter to deal with *A. maculatus*: the larvae appear to be able to live in the backwaters even of strong streams, so that ultimately the only course appeared to be that of piping the streams—a costly measure. Fortunately, however,

STRICKLAND later suggested that the best way to deal with such streams was simply to leave the jungle growing over them. *A. aconitus* causes the malaria of the Inland Plain. It is impossible to give in the form of a review all the numerous difficulties which the author and his friends have had to contend with, the ingenious methods which they have devised for dealing with them, and the many interesting zoological and epidemiological facts which have come to light.

Quinine treatment has also been tried in many of the plantations, but (as I can verify from the results of quinine prophylaxis during the War) with very doubtful success. As long as the drug is being actually given the parasites remain few in the bodies of their victims; but it requires at least three months' continuous treatment to eradicate the malarial invasion entirely even in England, where there is no reinfection. We can understand therefore how much quinine must be given to remove infection entirely where the patients are constantly subjected to reinfection. Even such large doses as 30 grains daily have not sufficed to prevent infection by the mosquito, although they suffice to keep it down and to prevent serious attacks of illness—a very good asset. Hence, though the actual number of admissions to hospital in a plantation under quinine is smaller than in a plantation not under quinine, yet, actually, the number of infected persons tends to remain about the same in both, *ceteris paribus*.

The last chapters of the book deal with malaria at Kuala Lumpur and in Singapore, and the results are summed up in the penultimate one. Many years ago Dr. MELDRUM, of Mauritius, suggested that the annual "hump" of the death-rate curve which is found in malarious countries during the rainy months is due to malaria, and I think that this is certainly the case. By removing the hump and calculating on the basis of the figures which are found during the non-malarious months we can approximate, roughly, to the true malaria mortality—as I also suggested in my Mauritius Report. Such data must be resorted to for the simple reason that, in actual practice, we can get no better; and, judging by them, the total saving of life in the areas discussed in this book must have amounted to something like a hundred thousand lives, not to mention the saving in sickness and money. Altogether, it has been a great piece of work.

Ronald Ross.